APR 11 1960

ENGINEERING • CONSTRUCTION • OPERATIONS

PIPE LINE INDUSTRY

APRIL
1960

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How to Sharpen Your Thinking Habits 51

For a "Quick Look" at this issue, turn the page . . .

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APR 11 1960

PIPE LINE INDUSTRY

A GULF PUBLISHING COMPANY PUBLICATION

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CONTENTS and Quick Look

To help you put first things first, scan these time-saving digests, checking ☑ those you want to read first.

Follow-Up Tests on Internally Coated Pipe

☐ Remember the first report on the effect of internally coated pipe which appeared on page 36, July 1959, PIPE LINE INDUSTRY? The results showed a gain of 1 to 6 percent for an internal coating of epoxy resin. After a year's wait, Tennessee Gas conducted tests to duplicate the original results. They were highly successful.

By C. H. Klohn.....Page 30

Load Transport Trucks from Bottom, Save Money!

☐ Less installation is required; there are no overhead racks, etc. Too, labor requirements for a bottom loading terminal are less. This move on the part of the industry to switch from top to bottom loading was initiated by aviation loading where controls to prevent overflow and other hazards while speeding the loading rate were developed in recent years.

By W. L. Hunter.....Page 33

French Pipeliners Cross the Sahara Desert

☐ In laying a 24 and 22-inch line from Hassi Messauod to Bougie on the Mediterranean, the desert presented many difficulties, but not so many as the mountains near the coast. Portes de Fer, for instance, which means "Iron Gate" is a rocky barrier with a 75-degree grade both coming and going.

By Donald M. Taylor.....Page 36

30-Inch Pipe Line Pulled Along Persian Gulf Floor

☐ A 30-inch concrete-coated pipe line was pulled 19 miles along the floor of the Persian Gulf to complete a 99-mile long gravity crude system. This crossing is in water as deep as 160 feet. The contractor on this job calls his method the friction transportation method. It worked like this: A pull barge anchored by two wire lines to the opposite shore, winches some 4,000 feet of pipe out into the gulf. While the pipe rests, it winches itself ahead on its anchor lines to a position far enough from shore to make the next pipe pull. **Page 40**

Latest Techniques in Cleaning Lines with Detergents

☐ One method is to wash and rinse lines with gasoline. The gasoline—some 6,000 gallons of it—was inserted between two spheroids and the slug was moved through the line under a differential pressure of 5 to 10 psi. When the slug reached the end of the run, the line was blown down, and the slug was returned to its starting point. The procedure was then repeated with a new slug of gasoline.

By J. N. White and A. Bartoszek.....Page 43

The World's Most Unusual River Crossing!

☐ Rubber hose joints alternating with sections of 20-inch weight-coated pipe were pulled across the Red River near Alexandria, La., on the Gulf Interstate system. The purpose of the rubber hose was to allow the pipe line to take the contour of the river bed as it shifted and scoured—the U.S. Corps of Engineers would not allow dredging in this vicinity.

By Louis I. Pentzien.....Page 47

Sharpen Your Thinking Habits . . . How to Remember: Part 1

☐ It only stands to reason that you can't forget something if you really never learned it in the first place. Therefore, the first step to improving your memory is to learn better. Here are some learning techniques which will enable you to develop your power of retention—and remembering. You'll want to clip this one and refer to it from time to time.

By John D. Quinton.....Page 51

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Needed: Men With a Solid Punch

SWINGING FROM the hip after the U.S. Supreme Court squelched the Arapahoe Pipe Line case, New York Representative Emanuel Cellar now is proposing a bill that would prohibit a pipe line company from paying dividends when its main stockholder also is a shipper through the line.

Can you imagine a corporation using stockholders money to build a $100 million pipe line system, then be prohibited by law from paying dividends on it?

Although this left-handed attempt at divorcement completely ignores economic logic under our free enterprise system, so did the ill-conceived Tulsa antitrust trial and the numerous other government efforts to convict the industry on baseless charges. Yet, the oil, gas and pipe line companies involved have been forced to spend millions of dollars to vindicate themselves. And the same may well be true if the Cellar bill gains congressional support.

There are differences of opinion within the companies involved as to what to do about Representative Cellar's proposed bill. Some want to ignore it. Others want to nip it in the bud before it blossoms into another costly round of economic lessons for federal lawmakers.

One of the most outspoken advocates of the action approach is Sun Pipe Line Company President William C. Kinsolving. (The industry should have more men like him.)

Never one to mince words or straddle the fence when his company or industry is challenged, Mr. Kinsolving recently summed up current pipe line industry difficulties with government and the public as follows:

". . . I know of no industry today more subject to attack, more grossly maligned or more used as a public whipping boy by demagogic and irresponsible representatives in Congress than is the oil industry.

". . . More particularly, the pipe line industry seems to be one of the archcriminals of this alleged gigantic oil combine. Certain congressmen always are saying that while a company might lose money in one phase or another of the oil industry, it can always make it up by the 'great hidden profits' of the pipe line industry.

". . . The average politician does not care if his accusations are based on false premises or unsound facts, so long as he can appeal to the uninformed electorate and get votes, and the more uninformed they are, the better his case.

". . . Management must be ready at any time to immediately meet these attacks head-on in open forum and public meeting places, and this should not be done altogether by legal counsel, but by those people who are directly responsible for the management and policies of the company. I am afraid, so far as the oil business is concerned, that this has been one of our weaknesses in the past.

"I have tried in my own mind to analyze why businessmen today are so prone to not want to get up and defend themselves before such attacks. Let us take the case of the big labor leader today. He certainly cannot be called a shrinking violet. He casts his voice from the housetops.

"He attributes all of his actions to the most altruistic motives and all who oppose him are enemies of mankind. He is always telling of the many benefits derived from his mighty efforts. In other words, he is applying the old adage, 'It pays to advertise,' (sometimes even if his copy is lousy).

". . . Certainly I do not advocate that the business executive follow in the footsteps of the labor leader or the politician, but he could in a dignified way spend some of his time and money to acquaint the general public with the intangible benefits which grow out of a successful venture . . ."

In short, pipe line companies will continue to be perennial political scapegoats as long as the industry hides its head in the sands of conservatism and fear of public opinion.

Antitrust suits and ridiculous anti-industry congressional action will continue to eat deep into company budgets until management gets off the defensive and takes positive action to create public understanding and good will toward the industry.

Other industries, labor and politicians swing from the hip when their vital interests are at stake.

Why should the oil and gas industry do less?

SPECIAL REPORT TO CATERPILLAR OWNERS:

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...cost less per hour

OPTIONAL TRACK GROUPS

up-date D9 or D8 Tractors for longer undercarriage wear

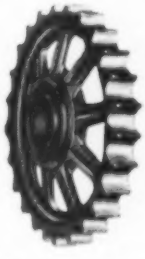
Now, two types of track groups are available for older model D9 and D8 Tractors . . . regular and optional, allowing you to tailor your undercarriage parts to meet job conditions.

Lighter tones at top of etched cutaways show depth of special hardness in wear zones.

REGULAR track parts are made from durable steel. They're heavy-duty, long-lived, special-hardened to resist wear.

OPTIONAL track parts are equivalent to those used on current production model tractors. The links and shoes are made from Caterpillar's new alloy steel that is hardened much *deeper* than regular steel. Link rails are hardened twice as deep. Shoe grousers are hardened 400% deeper. The new alloy steel also provides greater strength with more impact resistance.

MORE METAL WHERE IT COUNTS. Optional components are king size. Every part is beefed up and made bigger with more *hardened* steel in wear areas.



BORALLOY "HUNTING TOOTH" SPROCKETS are another new feature of the optional groups. Every other tooth is used in one revolution, alternate teeth being picked up the next revolution. This alternation means that teeth contact the bushings only *half as many times* as do regular sprocket teeth. More important are the teeth themselves—they're *machined* for exact fit with the big bushings. This greatly extends bushing life.

COMPARE regular and optional track components:

	Pitch	Pins O.D.	Bushings O.D.	Track shoe bolts and nuts	Sprocket
D8	regular 8 inches	1 3/4 inches	2 3/4 inches	3/4 inch	14 tooth
	optional 9 inches	2 inches	3 inches	7/8 inch	25 tooth
D9	regular 9 inches	2 inches	3 3/16 inches	7/8 inch	28 tooth
	optional 10 1/4 inches	2 1/4 inches	3 3/8 inches	1 inch	25 tooth

HOW MUCH MORE LIFE? Variation in the length of track life occurs because components have different wear rates under various soil and job conditions. In sand, pins and bushings wear faster. In rock, shoes and links wear faster.

ON-THE-JOB TESTS confirm that the new optional track components are giving up to 40% more life than the regular parts. On many applications, you can expect even greater wear life.

CORRECT TRACK GROUP SELECTION IS IMPORTANT. It depends on job types and conditions. Let your Caterpillar Dealer analyze your track needs. He'll recommend the correct components to help you get maximum life at the most reasonable investment. Call him soon.

SERVICE TIP: **FREE!** Handy reference for ordering track options. "New Options for D9 and D8 Tractors" includes part numbers that are used to adapt to your older models. Pick up a copy at your Caterpillar Dealer's.

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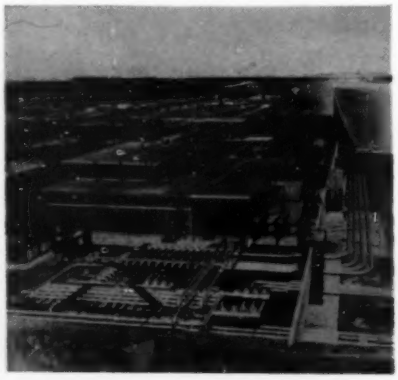

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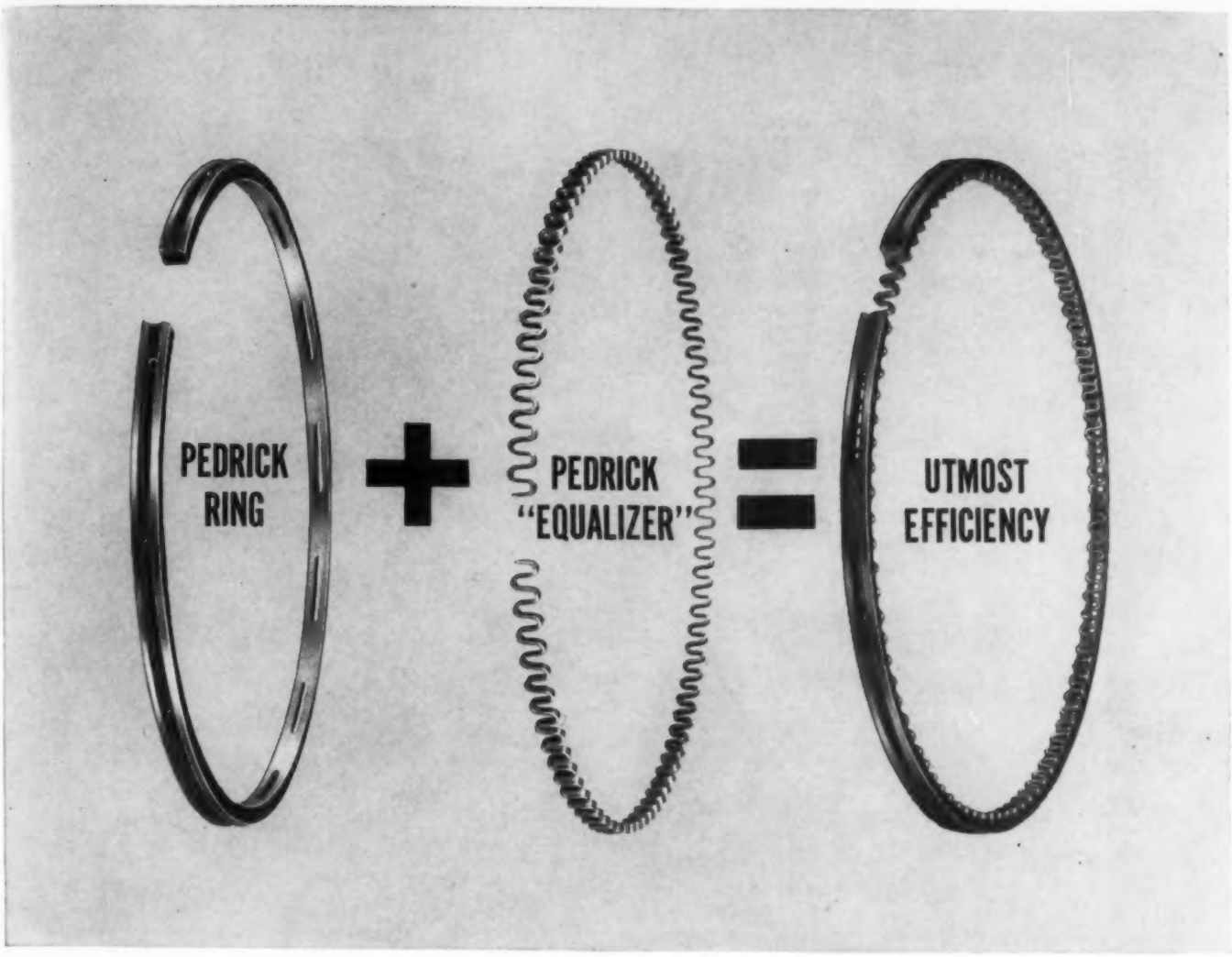

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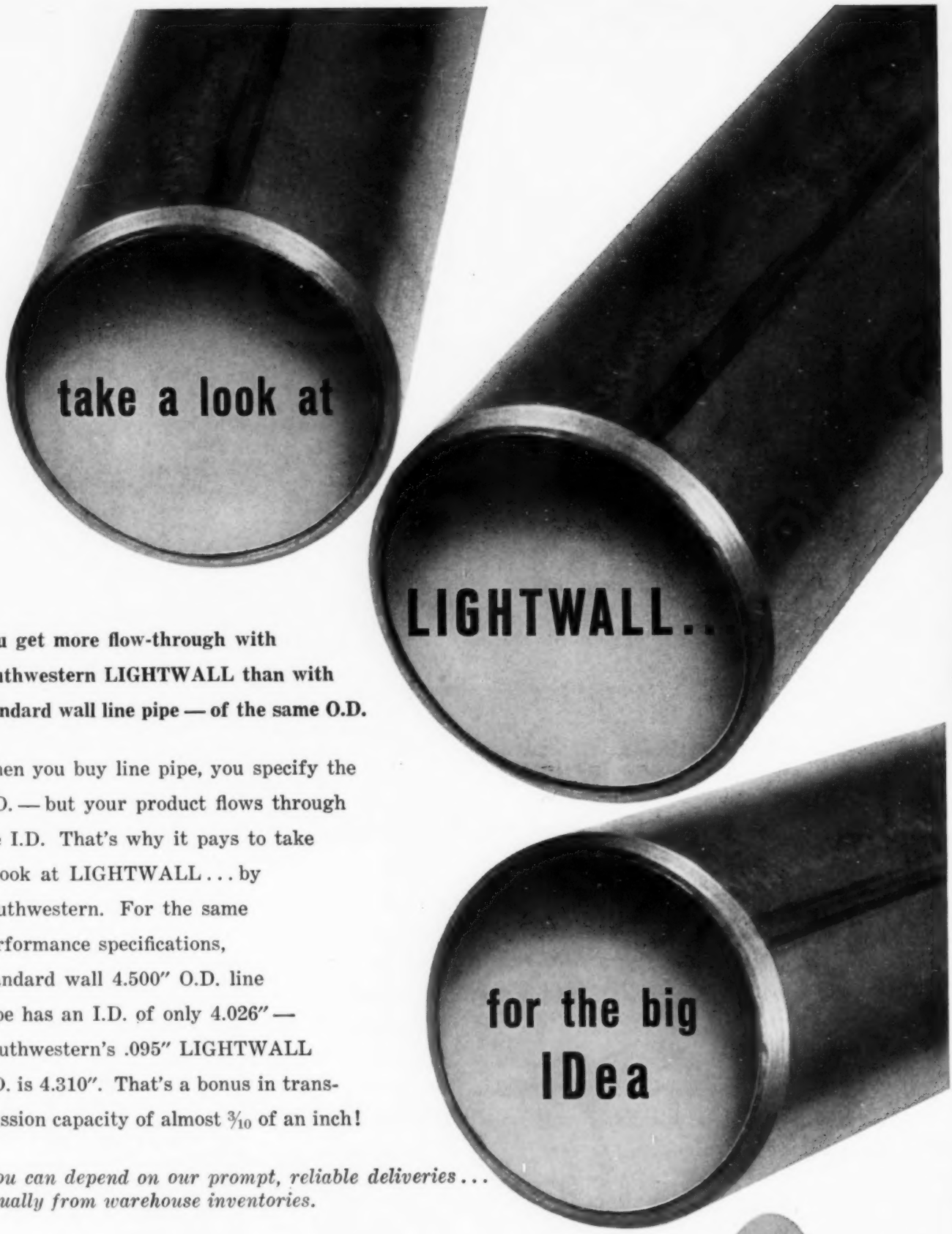

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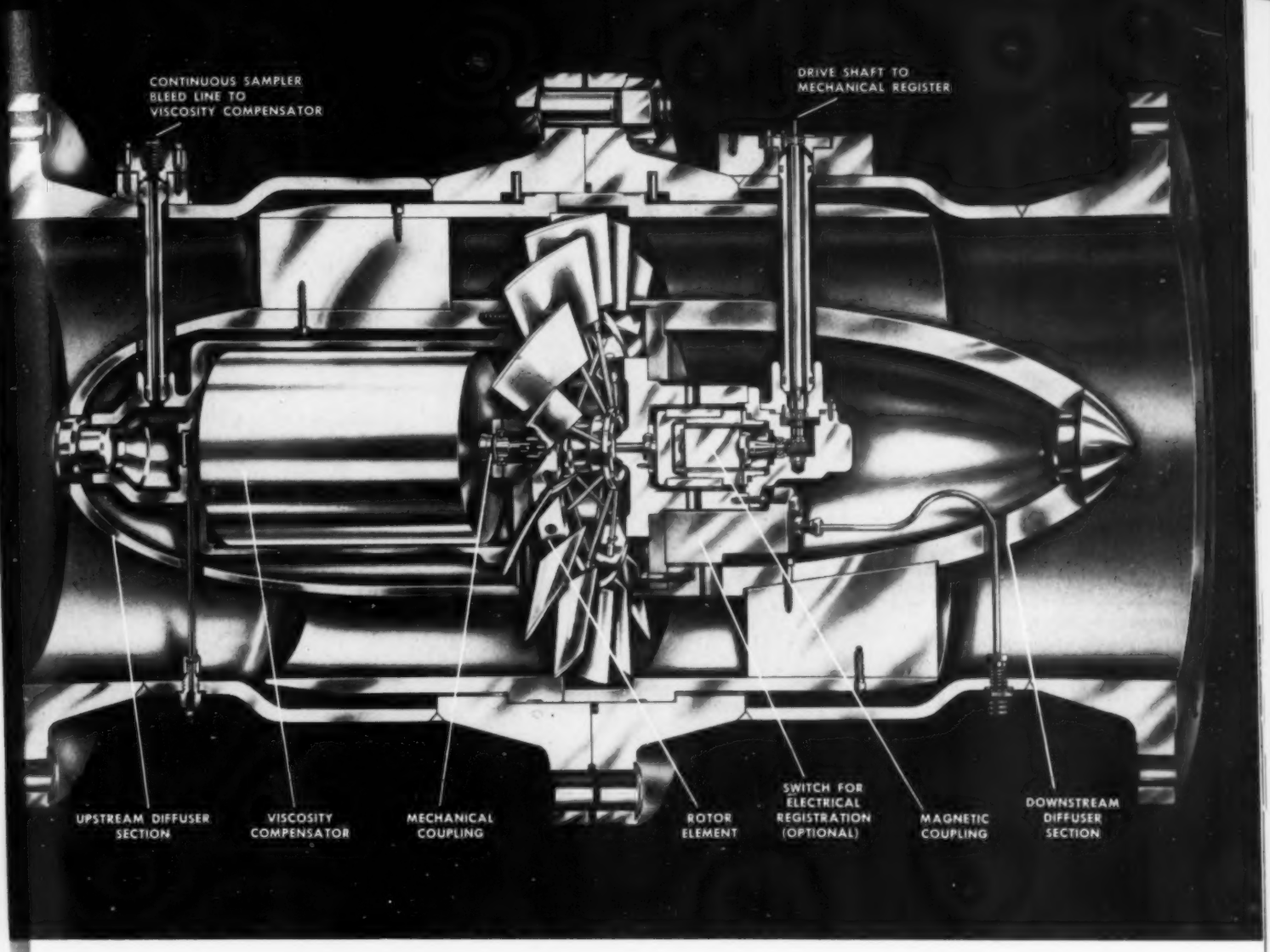

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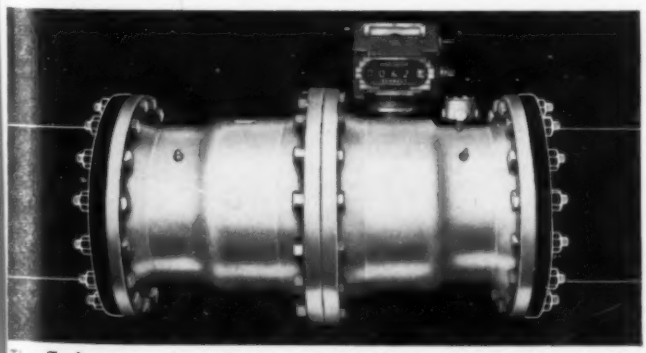

The Turbo-meter is no larger in pipe diameter than pipe size. Its length is less than three pipe diameters. Compared to other meters it weighs much less.

A balanced, smooth running air foil turbine rotor, mounted on ball bearings provides precision dependable measurement. Head loss is negligible since there are no close clearances or contacting parts. This also cuts wear and keeps the meter in accurate calibration. A magnetic drive to the register eliminates the need for a stuffing box. An electrical pick-up for remote registration is optional.

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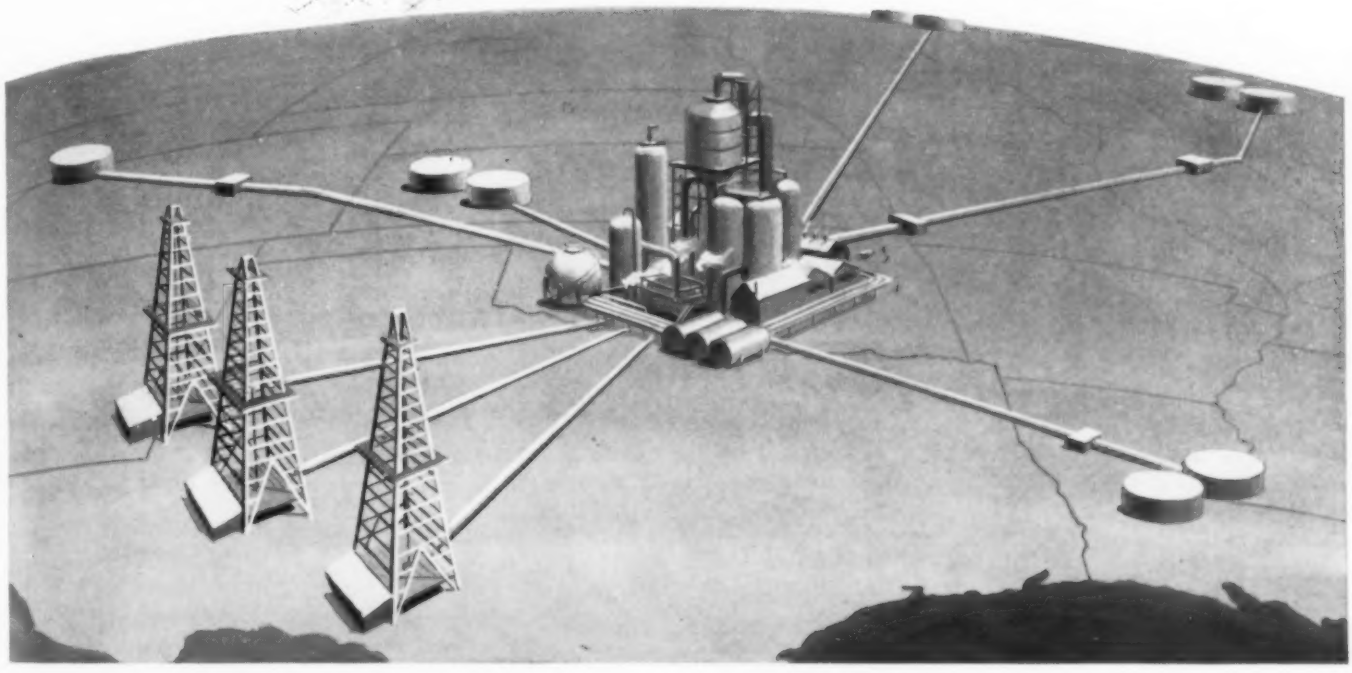

Optimum pipe line operation requires fast and accurate analyses of the many variables involved to assure economic delivery of pipe line products.

A Link Pipe Line Simulator is an indispensable tool for **profit-minded** pipe line management. It incorporates high-speed digital/analog computing techniques to—

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WICKWIRE ROPE
DOUBLE GRAY-X DOUBLE GRAY-X
A CF&I PRODUCT

7537

EXTRA BONUS **— In addition to longer life, Double Gray-X gives you the EXTRA STRENGTH of Double Gray Wire Rope. Made with an independent wire rope core of the same extra high strength steel, it has a 15% higher breaking strength than the catalog breaking strength of an improved plow steel rope with IWRC.**

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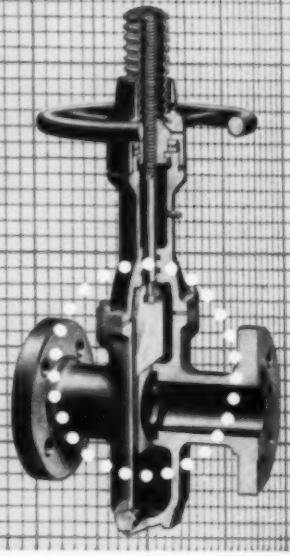

FLOATING SEATS MAKE THE SEAL

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WRITE FOR CATALOG 1200

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5925

TOUGH WINTER JOB WITH CATERPILLAR'S NEW

New Cat No. 583 Series H Pipelayer cradles for the dope and wrap machine. It is one of 14 Caterpillar-built rigs used on this spread by Engineers Limited Pipeline Co., El Cerrito, California.

New Cat No. 572 Series D Pipelayers handle 26-in. pipe. Production on the 138-mile project averaged 8000 to 9000 feet a day.

---EASIER EQUIPMENT

New Cat D9 Series E Tractor with Kelley Ripper manufactured by Crutcher • Rolfs • Cummings, Inc., rips through frozen ground. The D9 also handled clearing and backfilling jobs.

You expect problems on any pipeline job. And this one, from Rossville, Illinois, to White Pigeon, Michigan, is no exception. Engineers Limited Pipeline Co. has the contract for laying 26-in. pipe on this 138-mile stretch for the Trunkline Gas Co. of Houston, Texas. To push the job through, Engineers Limited set up an equipment spread on each end of the line—*100% Cat.*

The job started in December under severe winter working conditions. Frozen ground presented a digging problem. When it thawed, there was a drainage problem in areas with high water levels. Cat equipment on the western spread included a giant new D9 Series E Tractor with Kelley Ripper ripping the frozen ground in one pass . . . a new No. 583 Series H Pipelayer alternating between lowering and wrapping duties . . . five new No. 572 Series D Pipelayers with cradling and lowering-in assignments . . . and D8 and D7 Tractors.

Have you seen the new pipelayers?

New model or old-timer, Cat pipeline rigs get tough jobs done in a hurry. But to know what *performance* really means, look at the three new Cat-built Pipelayers—they incorporate advances in design and manufacture that increase your production and lower your operating and maintenance costs. They are briefly described here, but for complete information, see your Caterpillar Dealer. Learn about the giant strides in progress made in the three newest Cat pipeline rigs.

Caterpillar Tractor Co., General Offices, Peoria, Illinois, U.S.A.

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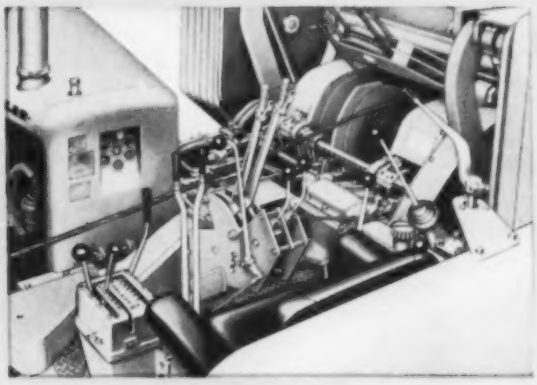
MODERN, HEAVY-DUTY PIPELAYERS FOR THE HARD WORK

3 NEW CAT-BUILT PIPELAYERS



No. 583 Series H

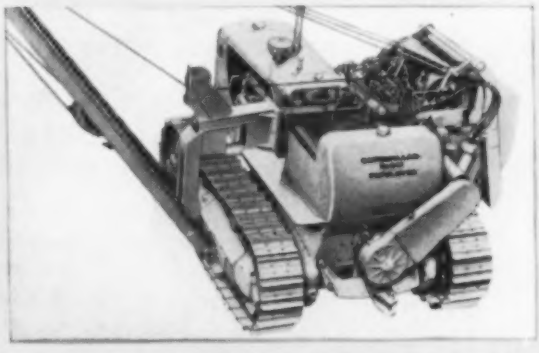
235 HP 137,000-lb. lift

Now optional on the No. 583—Power Shift Transmission! Big boon to any operator, it gives the No. 583 new finger-touch control, split-second gear changing . . . new precision control even in the toughest terrain . . . new top efficiency in all speeds and working conditions. The heaviest pipe jobs can now be handled even faster with the No. 583 with Power Shift Transmission! And the closely-retractable counterweights and good machine balance under load make the No. 583 champ of any job.

No. 572 Series D

140 HP 86,000-lb. lift

A new Turbocharged Cat Engine gives the new No. 572 a 9% increase in power over the former model. The most modern pipelayer in its class, it has such advanced Caterpillar features as lifetime lubricated rollers . . . the dry-type air cleaner, which removes 99.8% of all airborne dirt from engine breathing . . . and many others. It's the "take charge" machine for handling 26-in. pipe with capacity left over.



No. 561 Series B

93 HP 38,800-lb. lift

A new power plant that delivers 93 flywheel HP is designed for high torque at slow speeds, long life under heavy loads. The No. 561 is available with hydraulically-controlled counterweights or stationary arrangements for a wide range of lifting capacities. A new cockpit provides more comfort, easier control. Other features are the exclusive Cat oil clutch . . . hydraulic track adjusters that permit track adjustment with the easy stroke of a grease gun . . . and, of course, lifetime lubricated rollers. This new rig can handle more of your jobs with ease, speed and profit!

PROTECTION *is our business*

Through complete Quality Control — Nicolet Asbestos Pipe Line Felts have received universal acceptance for their uniformity and absolute dependability.

Whether your pipe line requirements demand Nicolet Asbestos #15 "Standard", #8 "Tufbestos" or #10 "Reflecto" (the new, improved, white Asbestos Felt) you are assured of getting the best protection obtainable.

And now—the addition of "Old Nic" Glass Wrap to this family of Pipe Wrap products makes Nicolet your best source for complete pipe line protection.

"Old Nic" has uniform porosity which allows hot tar or asphalt enamel to bleed through, while letting hot gas escape, minimizing "holidays". "Old Nic" Glass Wrap will most effectively protect yard wrapped pipe against impact damage. It is equally effective in over-the-ditch operations.

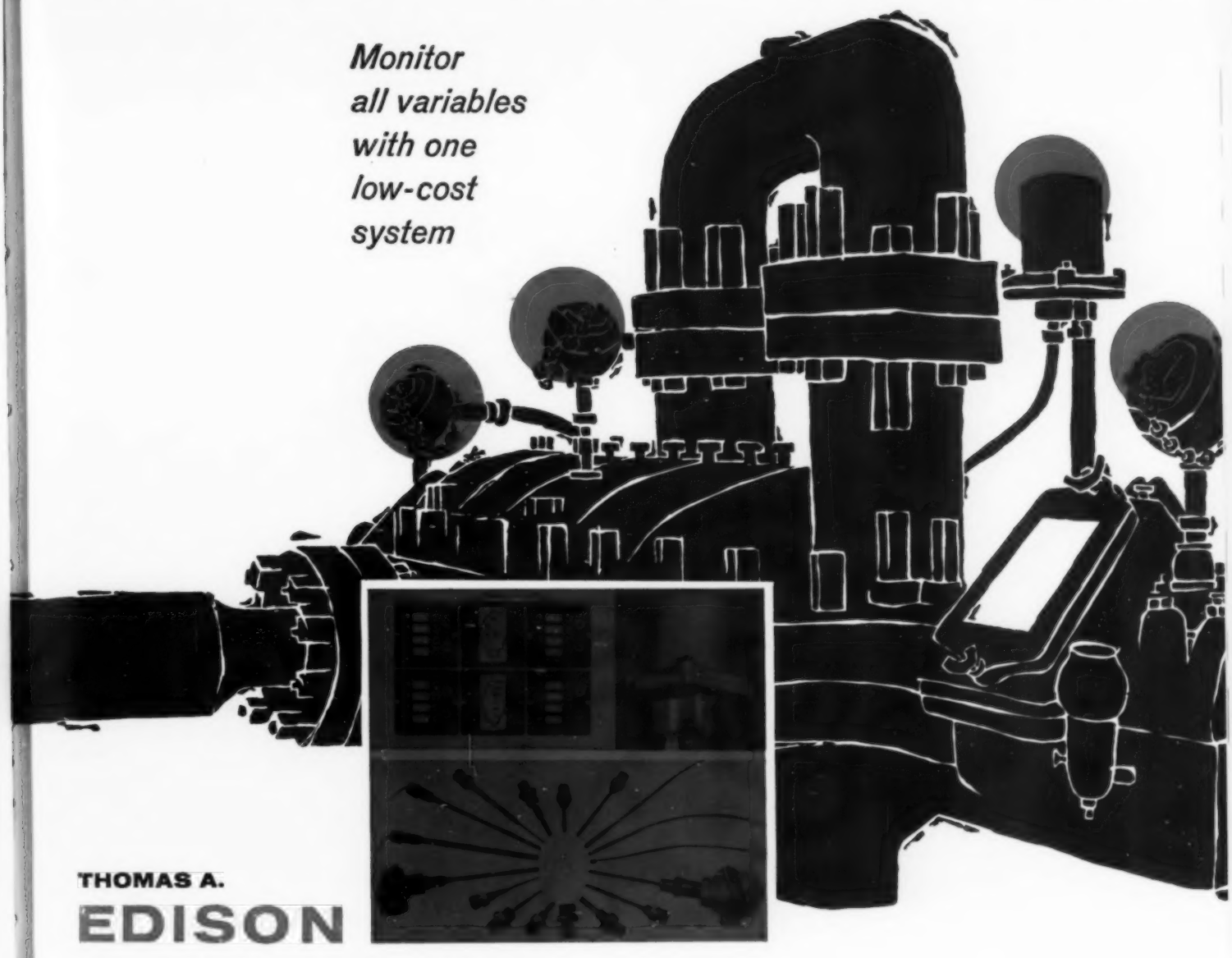
Write today for full specifications and samples of Nicolet pipe protecting products.

Distributed throughout the United States • District Sales Offices: Ford & Washington Streets, Norristown, Pa.; P.O. Box 777, Hamilton, Ohio

NICOLET INDUSTRIES, INC.

FLORHAM PARK, NEW JERSEY

Monitor all variables with one low-cost system



THOMAS A.
EDISON

omniguard system cuts operating and maintenance costs—

helps you make maximum use of manpower

Whatever your type of operation, manual, remote or automatic, you can reduce personnel, operating and maintenance costs with a low-cost Thomas A. Edison Omniguard monitoring system.

Virtually all critical temperatures and pressures can be guarded with this one system: motor and pump bearing temperatures, pump case temperatures, station suction and discharge pressures, unit suction and discharge temperatures and pressures, motor winding temperatures, and in compressor stations compressor cylinder temperatures, cooling water temperatures and lube oil temperatures and pressures.

In addition to guarding against equipment failure, Omniguard assures optimum use of your equipment. Due to its accurate monitoring you can operate your equipment at maximum load with complete safety. You'll be able to handle greater capacities with less equipment. Fuel and maintenance costs will be cut.

You'll require fewer personnel for monitoring because Omniguard does an accurate job of watching critical pressures and temperatures.

In automatic operation, Omniguard is readily adapted to computer operation and permits easy transmission of digital data. The reliable performance of Omniguard makes it ideally suited for completely automatic stations. Each temperature and pressure is monitored continuously by means of individual wheatstone bridge circuits. There is no scanning—no mechanical or electronic stepping switches to wear out or require maintenance.

For complete information see your Edison Representative or write for Catalog 3036C.

Thomas A. Edison Industries
INSTRUMENT DIVISION
95 LAKESIDE AVENUE, WEST ORANGE, N. J.

McGRAW EDISON

"We have Ford Trucks with 101,090 to 146,436 off-road miles and no major repairs"

says Mr. M. C. Kelsey
President
Rayflex Exploration Co.
Dallas, Texas

"Doing seismic work for the petroleum companies in their search for new oil fields takes our crews far from any road. Our trucks must follow a line cross-country, regardless of the terrain. And Ford Trucks come through where the others won't.

"We have 46 Ford Trucks from pickups to heavies. The Ford Pickups are used as survey trucks and personnel carriers . . . two-tonners are shooting trucks, recording units and drilling trucks . . . the Ford F-800 Heavies carry an HD 1000 combination air-and-water drill.

The Rayflex Exploration Co. of Dallas serves the petroleum industry throughout the United States from Canada to the Gulf, and operates overseas as well. At the present time it has seven crews in the field.

The trucks shown *(above)* are two of the company's Ford F-600's equipped with HD V-8 engine, 4-speed transmission, 2-speed rear axle, special grille guard, winch and non-spin rear axle.

"All our Ford Trucks have proven their durability and operating economy. For example, truck No. 151 (1952 F-100) has 146,436 rugged miles and the engine has never had a complete overhaul—just new rings and a valve job. Last year it operated at a cost of only 4½ cents per mile. Truck R-20C (1956 F-800) has 101,090 miles without major repairs. It has run for 7⅞ cents per mile. These cost figures include all gas, oil, maintenance and repairs.

"We have all Ford Trucks except for our 4 x 4 pickups, and now that Ford builds this type of unit we'll probably be 100% Ford in the future."

Again in '60
FORD TRUCKS
offer Certified Savings!

CERTIFIED FORD TRUCKS 1960 PROOF

CERTIFIED ECONOMY . . .

Yes, this year, if you buy a Ford Truck, you get a truck with certified economy in the three major expense items: gasoline, tires and initial price.

Best Gas Mileage! Results of second running of Economy Showdown U.S.A., show 1960 Ford ½-ton Pickups won every test—beat the average of other four leading makes by 13.1%.

Double Tire Life! Under average conditions, Ford's truck-type suspension gives double the front tire life of that obtained with "soft-type" independent suspension used on some 1960 trucks.

Lowest Prices!* New 1960 Ford ½-tonners are priced from $33 to $181 below those of leading competitive makes. List prices of all Ford Light and Medium Duty models are lowest in their class.

CERTIFIED DURABILITY . . .

The refinements built into the '60 Ford Heavy and Super Duty Trucks for longer life and greater reliability will also bring savings to your operation.

Automatic Radiator Shutters, standard on all Super Duty models, add considerably to engine life. Reduction of coolant temperature variations from a 79° range to a 20° range means less expansion and contraction, more efficient combustion and better lubrication.

Dynamometer Tests of Ford's submerged-type electric fuel pump showed no vapor lock at temperatures up to 200° F. Incipient vapor lock with mechanical fuel pump resulted in a 9% power loss under the same conditions.

Shaker Table Tests plus constant exposure to oil, water and heat proved Ford's 1960 wiring harness to be three times longer lived than the 1959 harness.

CERTIFIED ECONOMY REPORTS . . .

Certified results of these and other tests conducted by America's leading automotive research organization, plus a comparison of manufacturers' suggested list prices, are now available at your Ford Dealer's. Take him up on his offer to check the records . . . see and drive the new Ford Trucks . . . *and you'll save for sure!*

**Based on latest available manufacturers' suggested retail prices, including Federal excise tax, excluding dealer preparation and conditioning and destination charges*

FORD TRUCKS COST LESS

LESS TO OWN . . . LESS TO RUN . . . BUILT TO LAST LONGER, TOO!

REILLY REDHEAD

Translucent red color permits visible detection of any areas missed in cleaning... any areas not covered by primer... any areas not covered by enamel!

New Reilly Redhead, a quick-drying synthetic primer for hot coal-tar enamels, is compounded specifically for difficult drying conditions where initial high bond strength is mandatory. Reilly Redhead provides initial bond strengths up to several times greater than typical non-synthetic primers and fractionally greater strength than Reilly coal-tar base primers X-1 and X-10.

Reilly Redhead dries to touch in 5 to 10 minutes after application to metal surfaces at 70°F. where relative humidity does not exceed 70% and is free from organic solvent vapors. It dries hard, ready to accept enamel, within two hours under the same conditions.

Other important advantages are:

- *Offers greater film life; protects clean surface several weeks if enameling is delayed.*
- *Conforms to specifications under consideration by A.W.W.A. and governmental agencies.*
- *Performs advantageously with all Reilly plasticized hot application enamels.*
- *Is available in 55, 5 and 1-gal. containers, in carloads, carloads mixed with enamel, or less than carload, shipped from Indianapolis, Ind. or Lone Star, Tex.*

Write today for complete information on new Reilly Redhead, the quick-drying high bond strength synthetic primer. See how you can use Reilly Redhead profitably in your operations.

Reilly TAR & CHEMICAL CORPORATION

TAR PRODUCTS DIVISION 1615 Merchants Bank Building
Indianapolis 4, Indiana

ELECTRONIC PIPE LINE CONTROL?

This Taylor system gives you these customary features—

- *No transmission lag*
- *Can be used for remote measurement—over limitless distances*
- *Exceptionally fast speed of response*

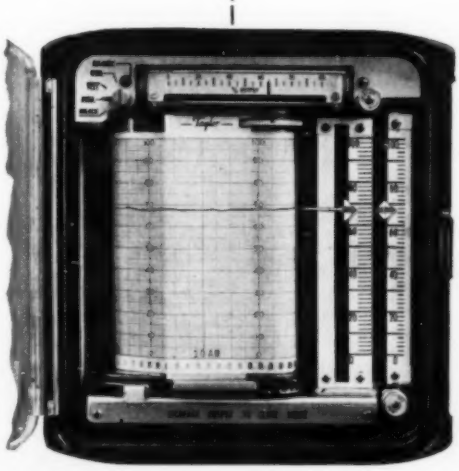
without sacrificing *Dependability* and *Quality*. Here's why:

No. 700R Electronic Controller

- Provides smoother transfer of suction discharge pressure and/or flow override control because there is no "reset wind-up".
- Much faster than any other electronic controller—flat out to 120,000 cpm.
- Rate action available down to 0.0016 mins.
- Gives smooth start-up on booster stations because diode limiter circuit eliminates reset wind-up.

No. 707T Electronic DP Transmitter (Left)

- Extremely reliable for unattended stations. Has no vacuum tubes, no transistors. Unaffected by vibration.
- Ideal for use where paraffin is present because nothing exposed to the process except end plates (steel or 316 stainless steel) and 316 stainless steel diaphragms.
- Can be used with reciprocating as well as centrifugal compressors because of internal silicone damping—continuously adjustable to damp out pulsations from 5 to 100 cpm.
- Cannot be damaged on remote station start-up because of full overrange protection to 1500 psi—either high or low sides.



No. 700J AC or DC Electronic Recorder (Left)

- Powerful servo motor provides accuracy of ½ of 1%, sensitivity to changes of 0.1% in input signal.
- Simplified tie-in of subsequent operations or auxiliary equipment permitted by operation of integral servo-operated alarms.
- Big 4" rectilinear chart gives 30 day record (1" per hour).
- Completely transistorized, unaffected by ±10% line voltage variation.

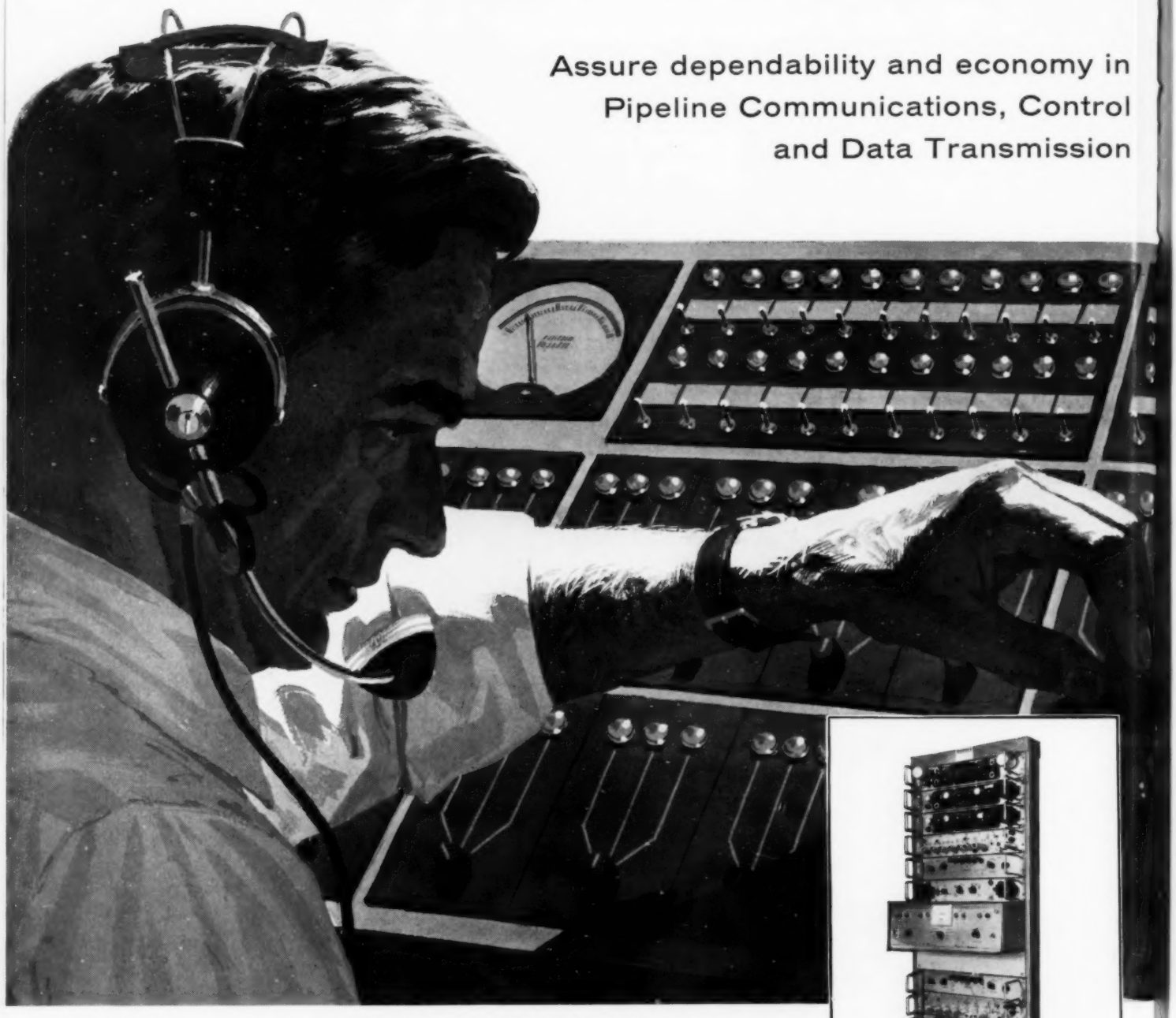
• • •

Call your Taylor Field Engineer, or write for appropriate bulletin.
Taylor Instrument Companies, Rochester, N.Y., or Toronto, Ont.

Taylor Instruments MEAN ACCURACY FIRST

PHILCO MICROWAVE
COMMUNICATIONS SYSTEMS

Assure dependability and economy in
Pipeline Communications, Control
and Data Transmission



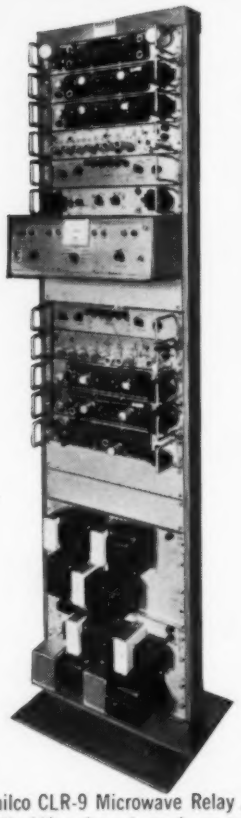
Philco microwave systems are known for dependability, flexibility and economy. Custom designed to meet each specific requirement—and featuring Philco's time-proved CLR-9 duplex microwave terminal—these systems provide highly reliable, unattended point-to-point communications facilities for voice, telemetering, VHF and remote control of pipeline operations . . . plus high speed data transmission. For the finest in microwave systems, specify Philco.

Benefit, too, from Philco's efficient TURNKEY SERVICES which include . . . Site Survey • System Planning • Installation • Field Service. We welcome your inquiries.

Government and Industrial Group, 4700 Wissahickon Ave., Philadelphia 44, Pa.
In Canada: Philco Corporation of Canada Limited, Don Mills, Ontario.

PHILCO®

Famous for Quality the World Over



Philco CLR-9 Microwave Relay . . . with 240 voice channel capacity. Available in Common Carrier, Industrial and Government bands.

adds greater value to CROUSE/HINDS EV Series explosion-proof lighting fixtures

Now, at no extra cost to you, this new Crouse-Hinds Prismatic Globe reduces troublesome glare while increasing "seeing" brightness. Provides more efficient working light, by softening and distributing the light evenly – without reducing the amount of usable light.

By eliminating "hot spots", the Crouse-Hinds Prismatic Globe reduces eye-fatigue . . . especially important in areas where reduced worker efficiency is itself a potential hazard. Prisms are inside the globe to keep the exterior dust-free. Prismatic Globes are furnished with 100, 150, 200/300 and 300/500-watt sizes of Crouse-Hinds EV Series explosion-proof lighting fixtures.

- **Reduces glare**
- **Gives uniform brightness**
- **Eliminates normal "hot spot" below fixture**

Crouse-Hinds Series EV Explosion-Proof Lighting Fixtures are easy to install and relamp, provide high lighting efficiency in areas classified as Class 1 hazardous by National Electrical Code. Available in choice of mountings, with a variety of reflectors for incandescent and mercury-vapor lamps.

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SYRACUSE / NEW YORK

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CROUSE-HINDS COMPANY OF CANADA, LTD., TORONTO, ONT. CROUSE-HINDS INSTRUMENT COMPANY, INC., SILVER SPRING, MARYLAND

If you need a brush cutter like this– we've both been missing a bet!

We're a little ashamed to admit we've never tried to sell the pipe line industry these cutters. You see, Servis Equipment Company *originated* the tractor powered brush cutter. And as the picture indicates, ten years later we're still producing the most rugged cutters made.

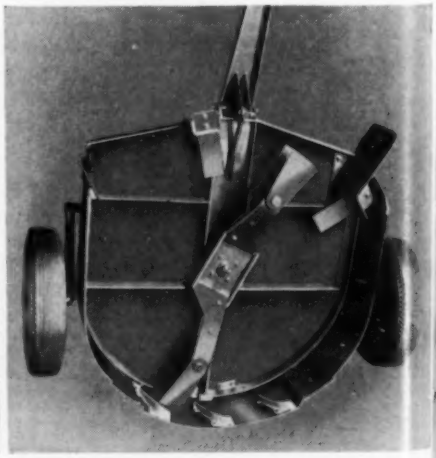
Sticking too close to the farm has been our trouble. Of course, we *have* sold to state highway departments and to the Air Force, but the red tape was so involved that we found it more efficient to concentrate on the farmers . . . even in South America and Africa.

A pipe liner in West Texas bought one of our Gyro 66 Brush Cutters the other day. It cut up tough mesquite brush on his right of way like nothing had before. He was so enthusiastic, he said we ought to tell other pipe liners about it, gave us the name of this publication.

It's true, Servis cutters will take on the toughest job — we've demonstrated them on a row of 4" x 4" posts. The secret is in low tip speed, but extra heavy blade assembly for tremendous momentum.

We have dealers from Carlsbad to Caracas. There's one near you. Clip the coupon and send for his name.

Underside shot shows heavy construction. A-shaped blade carrier, optional extra blades for fine shredding.



Servis EQUIPMENT CO. DALLAS, TEXAS

Servis Equipment Company Dept. 1
1000 Singleton Blvd.
Dallas, Texas

Please send me information on items checked.

Name_____

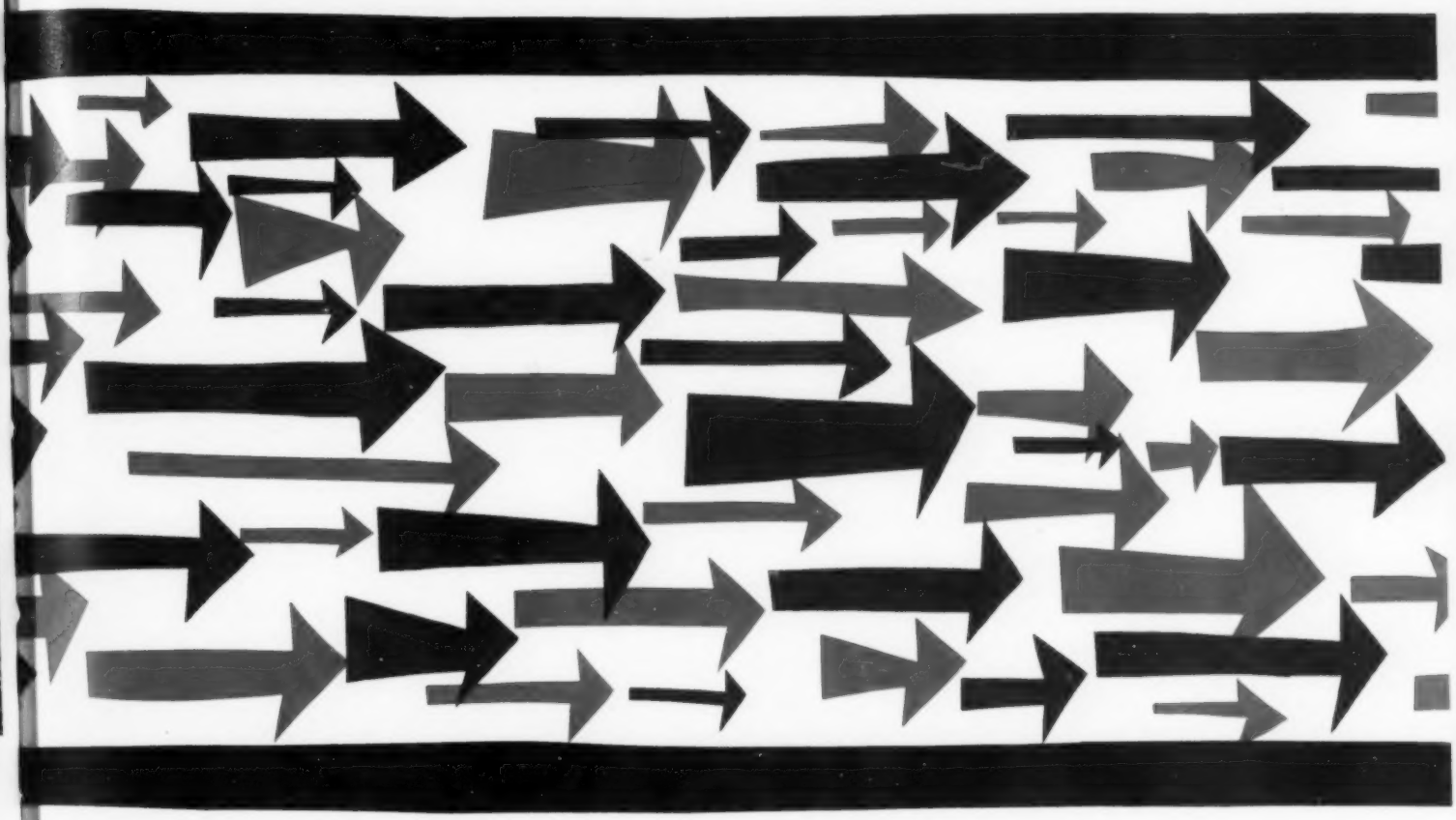
Address_____

City_____ State_____

Type Tractor Owned_____

- ☐ Gyro 140" Shredder (Pull-type)
- ☐ Gyro 84" Brush Cutter (Pull-type)
- ☐ Gyro 66" Shredder (Pull & lift models)
- ☐ Gyro 60" Shredder (Pull & lift models)
- ☐ E 60" Clipper (Pull & lift models)
- ☐ BM 60" Mower (Belly mount)
- ☐ Pasture Renovator
- ☐ Whirlwind Terracer
- ☐ Hudson Automatic Row Marker
- ☐ Dump-type Rake
- ☐ Soil Scraper
- ☐ Lone Star Blade (light, 6')
- ☐ 3-Way Ditcher-Terracer Blade, 6'
- ☐ Heavy Duty 3-Way Blade, 7'
- ☐ No. 7 Angledozer (w/Brush Rake at'chmt) (Row crop tractors)

"Make Pay Dirt Pay More — Join Your Soil Conservation District"



More pipeline thru-put without adding a single joint

Copon internal pipe coatings smooth the way for increased capacity

Leading transmission companies find that pipelines coated internally with Copon coatings deliver more thru-put . . . and with less compressing costs. Flow tests conducted on Copon-coated lines *prove conclusively* that transmission capacity has been increased. These tests have been conducted jointly with major pipeline companies over the past several years. Results endorse the value of Copon coatings for all types of pipeline systems.

Stretching pipeline capacity is an added bonus for internal coating. Copon coatings are specifically designed to provide maximum corrosion protection, to reduce maintenance costs, and to make possible delivery of cleaner products. Special applications are available for coating dehydrated gas lines, crude and petroleum product lines, salt water or fresh water lines, and oil well tubing and casing.

Ask your nearest Copon Associate for specific information on increased thru-put and valuable line protection. Then specify Copon — get the increased performance your pipeline can give you.

Use Copon to coat submerged or buried lines. Also on individual joints for new construction.

COPON ASSOCIATES

FOR CORROSION CONTROL

Copon®

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We're ready to roll with our modernization program. Whose communications equipment are you recommending?
Stromberg-Carlson's. It's the most complete and most flexible.

COMMUNICATIONS BY STROMBERG-CARLSON

Communications has been our business since 1894. Our public utility telecommunication systems from coast to coast are the envy of the industry.

With our experience and engineering skills plus full range of systems and components* we can meet your precise needs.

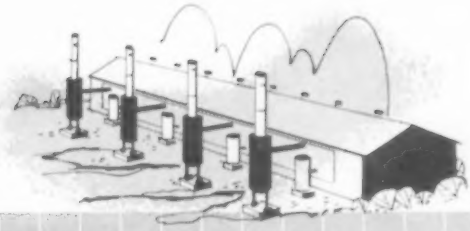
We are prepared to study your situation (without obligation on your part) and show how we can provide you with the communications you need to complete your modernization program. In Atlanta call TRinity 5-7467; Chicago: STate 2-4235; Kansas City: HArrison 1-6618; Rochester: HUbbard 2-2200; San Francisco: OXford 7-3630.

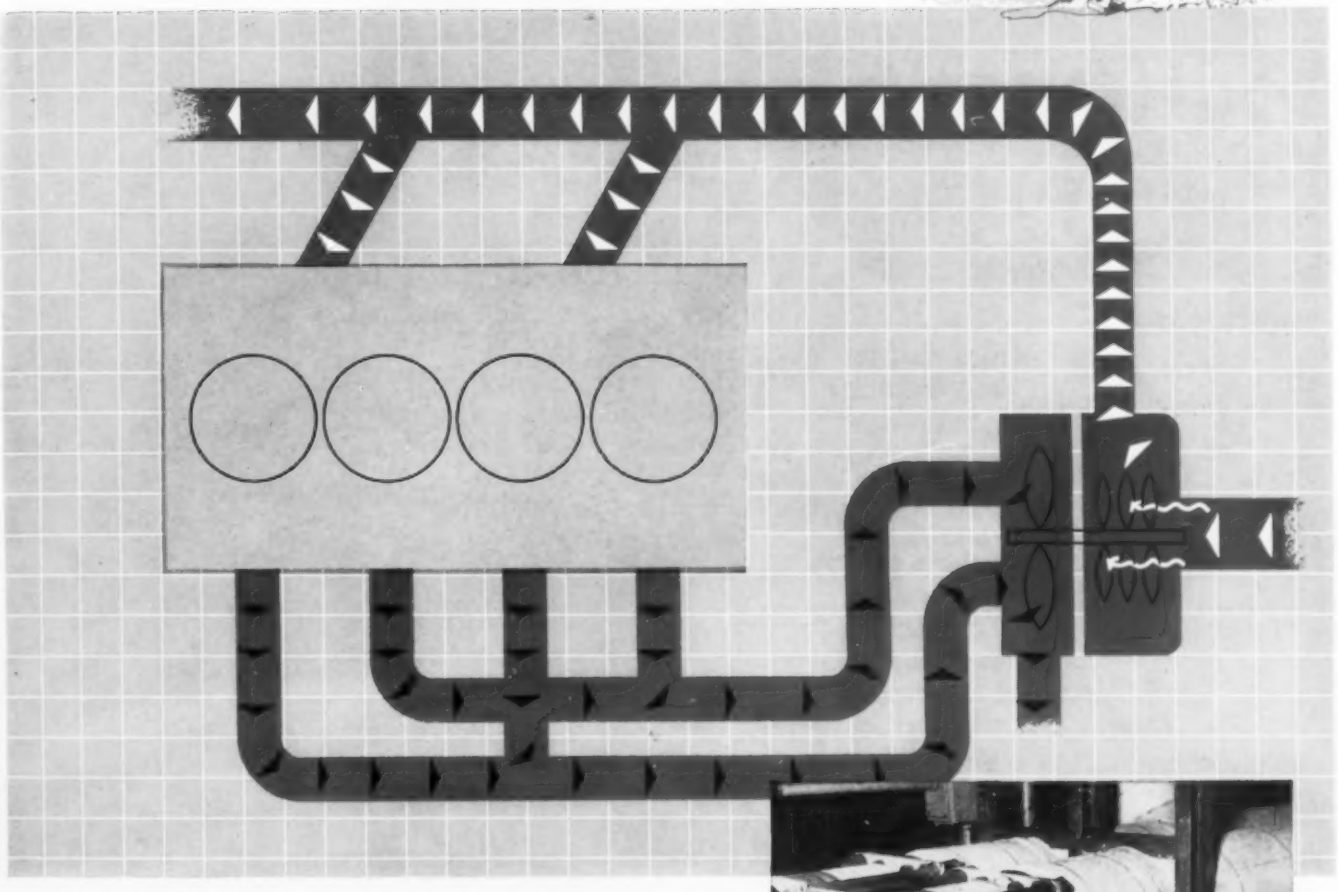
***Our equipment covers your three basic communication needs: transmission systems, switching systems, station gear and all associated equipment.**

STROMBERG-CARLSON
A DIVISION OF **GENERAL DYNAMICS**

Flexonics

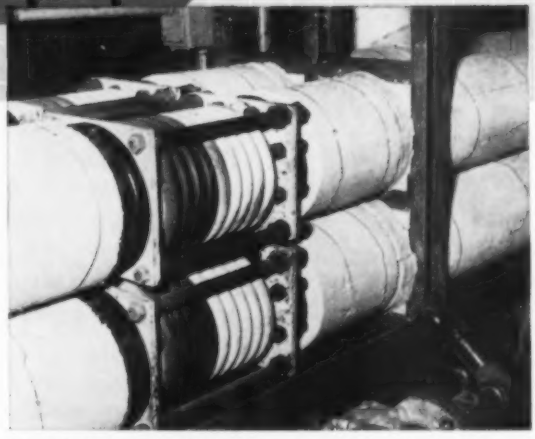
has the engineering experience to help you solve exhaust expansion problems when you turbocharge compressors





Here's a lively subject – *increasing gas pipeline capacity by turbocharging existing compressors in the field.* If you want the answers to the expansion problems that arise when the exhaust piping becomes an integral part of the operating loop, call on FLEXONICS engineers. They have the *specific* experience in this field that can mean actual dollar savings to you.

Write today for your free copy of this easy-to-read report. It tells you the dollars-and-cents facts that led an important pipeline company to a complete turbocharging program.



Special-design FLEXONICS Expansion Joints in the exhaust piping of a newly turbocharged compressor station.

EJMA **Member Expansion Joint Manufacturers Association**

EJ-250

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corporation

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EXPANSION JOINTS · METAL HOSE · SYNTHETIC HOSE · BELLOWS · AERO/SPACE COMPONENTS

A SUBSIDIARY OF CALUMET & HECLA, INC.

ATTACH TO YOUR LETTERHEAD—MAIL TODAY!

FLEXONICS CORPORATION
1420 South Third Avenue
Maywood, Illinois

Please send me my personal copy of your Technical Bulletin No. 175 giving the facts and figures on pipeline modernization through compressor turbocharging.

For more data on advertised products, use Readers' Service Cards, last page.

PLICOFLEX TAPE PROTECTS PIPE

UNDER GROUND

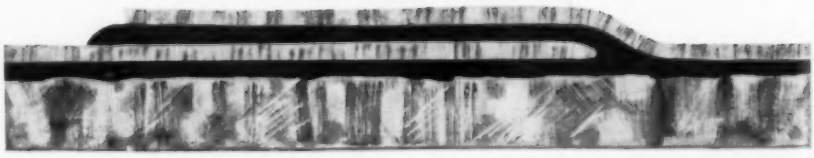
IN THE AIR

UNDER WATER

Vinyl outer layer
. . . tough, abrasion resistant
. . . non-conductor
. . . fungus and bacteria resistant
. . . waterproof

Butyl Rubber inner layer
. . . gasket-like seals
. . . conformity to surface irregularities
. . . non-conductor
. . . resistant to chemical, fungus and bacteria attack
. . . good bonding
. . . waterproof

Plicoflex primer
. . . superior bond between metal and tape
. . . adheres even under dusty conditions
. . . application unaffected by temperature (weather) extremes
. . . fills in even smallest of surface scratches and pits



Tension of elastic vinyl compresses the butyl rubber into surface irregularities and makes positive waterproof joints at the overlap of the tape.

Plicoflex pipe wrapping tape is available in widths up to 54", in thicknesses from 15 mils to 35 mils and in 10 standard colors.

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TRADE MARK

PLICOFLEX, INC.

2425 Mowery Rd. P. O. Box 45911 Houston 45, Texas
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PIPE LINE PANORAMA

New Report on Pipe Line Communications . . . Oil and gas industry has more than 700 users of radio spectrum, operating about 44,000 transmitters—excluding microwave. Also, 176 gas distributing companies operate nearly 18,000 transmitters. In addition, the industry is now operating, or has in planning stage, 1,200 microwave stations covering nearly 27,000 miles.

These statistics are included in highly informative 40-page report just released by National Petroleum Council. Items covered also include problems created by overcrowded air waves and suggested solutions—use and importance of radio in all phases of the oil and gas industry, including pipe line operations. Copies of report are available at National Petroleum Council, Suite 601, 1625 K Street, NW, Washington 6, D.C.

Transwestern Line Has Several "Firsts" . . . In laying Transwestern's 1,172-mile natural gas line from Texas to California, contractors have introduced many innovations, including:

- High-strength X-56 pipe is being double jointed and laid in 80-foot sections over mountainous terrain with excellent inspection results.
- Twelve welding machines on three tractor-driven units keeps welding operation moving constantly.
- All double jointed welds are X-rayed plus nearly half of field welds making it "most X-rayed cross country line." No leaks were found in first 200 miles of line.

Pipe Line Companies Use More Compact Cars . . . Following industry cost-cutting trend, Columbia Gas System plans to obtain 800 U.S. compact cars for use in its fleet of 3,650 cars and trucks. Estimated savings: $340,000 in fleet acquisition and operating costs in next four years.

Communications-Control Stressed at PIEA-PESA Meeting . . . Those attending 32nd annual meeting of Petroleum Industry Electrical Association and Petroleum Electric Supply Association in Kansas City, Mo., April 12-14, will hear several outstanding papers covering such subjects as: **Scientific Advances in Communications—Electronic Control of Pipe Lines—Applications of Data Transmission and Data-Phone in the Pipe Line Industry—Microwave System Maintenance—Remote Control and Metering Systems.**

Pipe Line Panorama . . . Natural gas producers are wondering if "tempest in teapot" scandal arising from alleged telephone confab between lawyer "representing" Midwestern Transmission and FPC Chairman Kuykendall will put serious kink in efforts to get new natural gas bill before Congress this session, even with industry agreement and Administration support . . . **From January through October last year,** 34 pipe line contractors reported accident frequency rate of 43.98, compared with 1958 all-industry rate of 6.17; gas utilities had 8.07 frequency rate . . . **Construction briefs:** Contracts will be let soon on first major LPG line. Katy Railroad's 1,500-mile line will carry LPG from plants in West Texas, New Mexico and Texas Panhandle to Madison, Wisconsin and the Minneapolis-St. Paul area, with no portion of line following Katy's right of way . . . **H. B. Zachry Company, San Antonio, and O. R. Burden Construction Corp.** have been awarded joint-venture contract on Texas Electric's 370-mile, 16-20-24-inch gas line from Texas Gulf Coast's Old Ocean field to Fort Worth. Estimated cost: $25 million.

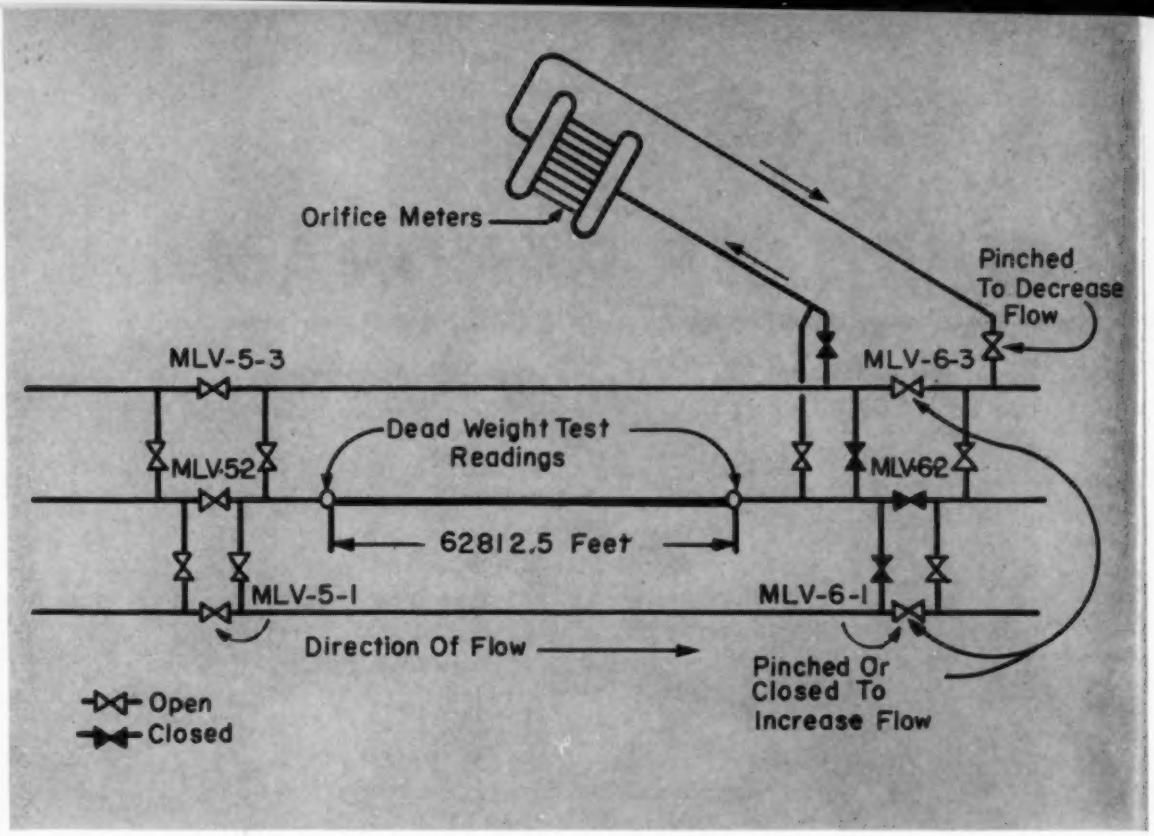

FIGURE 1—Schematic of the test area near Refugio, Texas. Note the orifice meters in the upper part of the drawing. This site was used by AGA some years back for orifice meter testing site.

Results of Follow-Up Tests on Internally Coated Pipe

The 11.9 miles of 24-inch pipe, coated internally in place, was re-tested a year after the original tests. Essentially the results were duplicated

By C. H. Klohn
Tennessee Gas Pipeline Co.
Houston

A SERIES OF FLOW TESTS was performed in December 1959 on an 11.896-mile section of 24-inch OD by .250-inch wall thickness pipe to determine the value of internal coatings to gas transmission. These tests were a follow-up of similar tests conducted in November and December of 1958, and described in July 1959 PIPE LINE INDUSTRY, Page 36.

The original tests indicated that at certain flow rates, deliverability can be increased by (1) cleaning a line internally if it is dirty, and (2) internally coating the line with epoxy resin formulations. Between 150 MMcfd and 450 MMcfd, thruput was increased by 5 to 10 percent depending on the rate of flow. This increase breaks down into an almost constant 4 percent directly attributable to the cleaning operation. (Prior to the original tests, the line had not been cleaned in 10 years.) An additional 1 to 6 percent increase directly attributable to internal cleaning and coating.

The tests conducted in December, 1959, were a continuation of the prior

The 1958 tests were reproduced within a very close tolerance of experimental error . . . there's little question as to the value of the coating

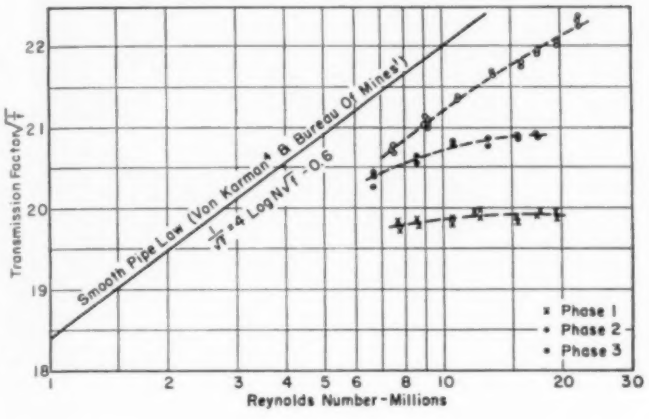
Transmission Factor $\frac{1}{\sqrt{f}}$
Smooth Pipe Law (Von Karman & Bureau Of Mines)
$\frac{1}{\sqrt{f}} = 4 \log N\sqrt{f} - 0.6$
Phase 1
Phase 2
Phase 3
Reynolds Number - Millions

FIGURE 2—Performance on original tests made back in November and December of 1958 of 11.896 miles of 24-inch, 0.250-inch pipe line under the following conditions: Phase 1—Line test after 10 years operation. Phase 2—Line test after cleaning with two wire brush type pigs. Phase 3—Line test after internal coating.

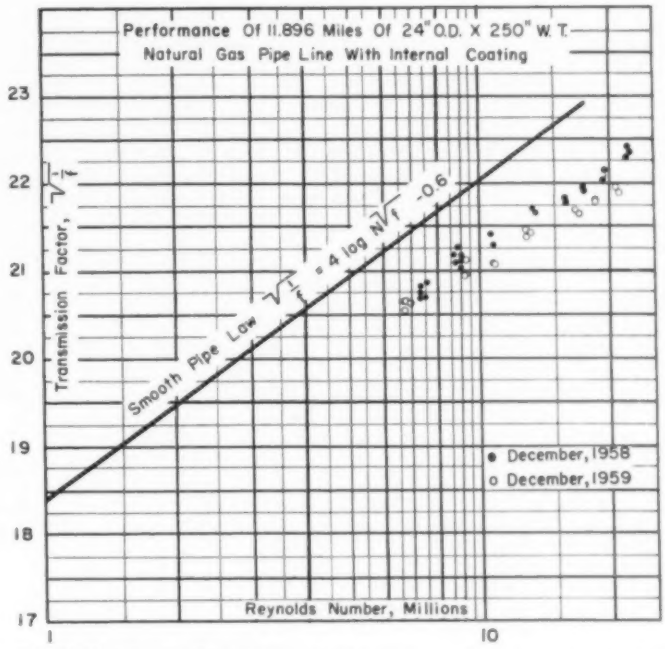
Performance Of 11.896 Miles Of 24" O.D. X 250" W. T.
Natural Gas Pipe Line With Internal Coating
Transmission Factor, $\frac{1}{\sqrt{f}}$
Smooth Pipe Law $\frac{1}{\sqrt{f}} = 4 \log N\sqrt{f} - 0.6$
December, 1958
December, 1959
Reynolds Number, Millions

FIGURE 3—Performance of the same pipe one year after the tests described in Figure 2.

ANALYSIS	COLS. 8-9 ANALYSIS CODE	COLS. 10-15 MOL. FRACTION	GPM 14.696 PSIA @ 60° F	SP. GR. @ 60° F (AIR = 1)
CARBON DIOXIDE	01	0.0035		0.0053
NITROGEN	02	0.0070		0.0068
METHANE	03	0.9474	16.057	0.5258
ETHANE	04	0.0310	0.788	0.0324
PROPANE	05	0.0072	0.197	0.0111
ISO-BUTANE	06	0.0013	0.043	0.0027
N-BUTANE	07	0.0012	0.038	0.0025
ISO-PENTANE	08	0.0003	0.011	0.0008
N-PENTANE	09	0.0004	0.014	0.0010
HEXANES	10	0.0007	0.029	0.0022
HEPTANES PLUS	11			
TOTAL		1.0000	17.177	0.5906

*COMPOSITE CODES:
1 - GREEN BRANCH LINE
2 - 16" VALLEY LINE
3 - DEAN (1+2)
4 - 26" VALLEY LINE
5 - SOUTH LOUISIANA LINE
6 - MAIN LINE TOTAL

FIELD DATA:
PRES. 595 PSI
TEMP. 67 °F
SP. GR. 0.593
H2O D. P. -3 °F @ 595 PSI
HYD. D. P. +50 °F @ 595 PSI
BTU -
SAMPLE Natural Gas
TAKEN BY Wilson
DATE 12-8-59
BOMB NO. E 8447

LAB DATA:
ANALYSIS NO. 1905
DLV. TEST NO. 4588
ANALYSIS BY C. E. Richardson
SP. GR. (BAL.) 0.593
SP. GR. (CALC.) 0.591
BTU (DRY) ** 1049
BTU (WET) ** 1031
BTU (DETERMINED)

REMARKS: **BTU/cu. ft. at 14.73 PSIA at 60° F

FIGURE 4—Gas sample analysis of test conducted to attempt to duplicate original findings of year earlier.

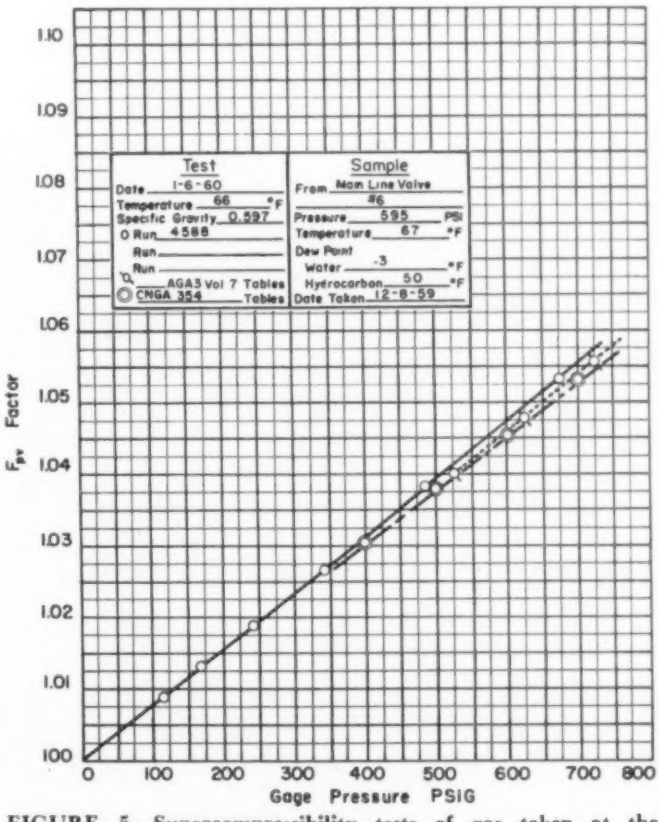

FIGURE 5—Supercompressibility tests of gas taken at the time or shortly after the tests.

TABLE 1—1959 Tests—Summary

TEST	Date	Starting Time	P_1 PSIA	P_2 PSIA	d_{P_r}	Qm MMCFD	G	T_1 °F	T_2 °F	Average $\frac{1}{Z}$	f	Viscosity M x 10^6	N_R x 10^{-3}	$\sqrt{\frac{1}{f}}$	Darcy Coefficient f_c
1-A	12- 7-59	2:45	649.86	630.61	0.26	202.06	.597	68	67.5	1.0960	.002247	7.70	9,196	21.10	.008988
1-AR		4:35	646.23	625.90	.26	203.22	.595	68	67	1.0955	.002273	7.69	9,366	20.98	.009092
1-AR1		5:20	645.71	625.37	.26	205.30	.595	68	67	1.0955	.002270	7.69	9,370	20.99	.009080
1-B	12- 8-59	10:25	637.16	610.96	.25	234.41	.593	68	67.5	1.1007	.002249	7.67	10,638	21.09	.008995
1-BR		10:55	637.83	611.57	.25	234.87	.593	68	67	1.1022	.002251	7.67	10,659	21.08	.009006
1-C	12- 8-59	2:05	650.22	614.62	.26	278.93	.594	68	66.5	1.0948	.002178	7.68	12,663	21.43	.008713
1-CR		3:25	650.77	615.21	.26	278.72	.594	68	66.5	1.0948	.002181	7.69	12,637	21.41	.008724
1-CR1		3:50	651.63	615.90	.26	279.30	.594	68	66.5	1.0953	.002186	7.69	12,664	21.39	.008746
2-A	12- 9-59	1:25	699.35	641.75	.27	370.10	.596	68	66	1.1005	.002133	7.73	16,750	21.65	.008533
2-AR		2:00	700.14	642.49	.27	370.31	.596	68	66	1.1011	.002136	7.73	16,760	21.64	.008545
2-B	12- 9-59	3:55	708.30	640.66	.28	405.26	.596	68	65	1.1012	.002106	7.73	18,342	21.79	.008424
2-BR		4:20	709.17	641.33	.28	405.41	.596	68	65	1.1012	.002113	7.73	18,348	21.76	.008452
2-C	12-10-59	1:35	730.23	649.71	.28	450.29	.598	68	65	1.1057	.002080	7.75	20,395	21.93	.008321
2-CR		2:05	731.43	650.60	.28	450.62	.598	68	65	1.1057	.002088	7.75	20,410	21.88	.008354
3-A	12-11-59	10:25	687.49	677.25	.28	148.05	.600	68	65.5	1.1043	.002350	7.75	6,728	20.63	.009402
3-AR		10:50	687.02	676.86	.28	147.46	.600	68	65.5	1.1043	.002349	7.74	6,710	20.63	.009395
3-AR1		11:45	686.84	676.59	.28	148.02	.600	68	66.5	1.1043	.002351	7.74	6,735	20.62	.009405
3-AR2		12:10	687.12	676.72	.28	148.49	.600	68	66.5	1.1043	.002373	7.75	6,748	20.53	.009490

testing, and like the preceding tests they were part of a joint project under the auspices of the following organizations: Texas Gas Transmission Company, Lone Star Gas Company, Transcontinental Gas Pipe Line Company, Humble Oil & Refining Company, El Paso Natural Gas Company, Trunkline Gas Company, Coast Paint & Lacquer Company, Pipe Cote Service Corporation, Northern Natural Gas Company and Tennessee Gas Pipeline Company.

Tests were conducted in the same manner, and with the same procedure as in 1958. The reader is referred to the initial report in July 1959 PIPE LINE INDUSTRY for these details.

Brief Description of the Original Tests. The original tests were organized in three phases:

Phase 1: The section was tested after 10 years operation.

Phase 2: The section was cleaned with wire brush pigs and tested.

Phase 3: The section was cleaned and coated. First, two wire brush pigs were used for cleaning, then a 3,000-gallon slug of methyl ethyl ketone was used as a detergent. The line was then coated with epoxy coating by pumping a slug of coating material contained between two pigs through the line. The section was then tested.

The over-all objective of the project was to resolve this question: *Does the condition of the internal pipe surface have much of an effect upon the deliverability in a large diameter pipe in commercial use?*

TABLE 2—Indications of Gas Quality in 1959 Tests

Test No.	Water Content #/MM	Hydrocarbon D.P. °F	Pressure PSIA
1-A	2.8	54	625
1-AR	2.9	58	620
1-B	2.1	49	605
1-C	2.7	52	605
2-A	3.0	54	630
2-B	3.5	54	630
2-C	3.9	58	640
3-A	2.0	50	670
3-AR1	2.7	52	670

Results of Original Tests. The question above is answered by an examination of Figure 2. The total increase in the transmission factor, which is directly proportional to deliverability, varied from approximately 5 percent at a Reynolds Number of 7 million to about 10 percent at a Reynolds Number of 18 million. As calculated by Tennessee Gas Pipeline Company engineers using Nikuradse's rough pipe law, the roughness of Phase 1 was 912 micro-inches and Phase 2 was calculated at 520 micro-inches. Phase 3—the coated pipe—had a roughness factor which could not be calculated since the transmission factor did not become constant, but the writer estimates (by continuation of Phase 3 curve) something less than 180 micro-inches.

Discussion of Recent Tests. The degree of stability obtained at the higher rates of flow was not as good as the 1958 tests. Pressure variations in most cases were 0.2 psi between the five minute readings. However, the pipe line pressure differential remained fairly constant.

Stability was best at the two low rates of flow, and results reproduced those obtained in 1958. At the higher rates however, both upstream and downstream pressures were consistently rising, which would tend to produce a lower-than-true transmission factor, since measurement facilities are downstream.

Figure 1 shows the transmission factors computed for the 1958 and 1959 tests. The 1959 tests are approximately 1 percent lower at the higher rates of flow. Part of this 1 percent may be attributed to the different degrees of stability attained.

The conclusion may be reached that the 1958 test results were reproduced within a very close tolerance of experimental error, and from this it can be concluded that there has been no apparent deterioration of the interior coating. —The End

Editorial Index Now Available

The Editorial Index is now at the printers and soon will be ready for distribution. The 1959 Editorial Index provides a time-saving entry into all 12 issues of PIPE LINE INDUSTRY published in 1959.

Bound in a handy pamphlet form, the Editorial Index lists each and every article and its author. To get a copy, write the Librarian, Gulf Publishing Company, P. O. Box 2608, Houston 1, Texas. Or, if you prefer, check the square provided on the blue Reader's Service Card at the back of this and every issue of PIPE LINE INDUSTRY.

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Loading transport truck from the bottom, using positive displacement meter with pre-set counter and set-stop valve to control quantity of product loaded. The danger of spillage is no greater than with conventional loading with displacement meters.

Load Transport Trucks From Bottom, Save Money!

Installation and labor costs are less; loading rates are higher for this type terminal

By W. L. Hunter
Senior Engineer, The Pure Oil Co., Chicago

BOTTOM LOADING for transport trucks is proving to be a practical, fast and safe method of handling petroleum products. The petroleum industry is in general agreement that bottom loading is a sound method of operation and may become adopted industry-wide. This broad acceptance will gradually occur as a transition from over-head loading to bottom loading takes place. The trial stage for bottom loading is being completed and major size terminals are being equipped with facilities for loading transports from the bottom.

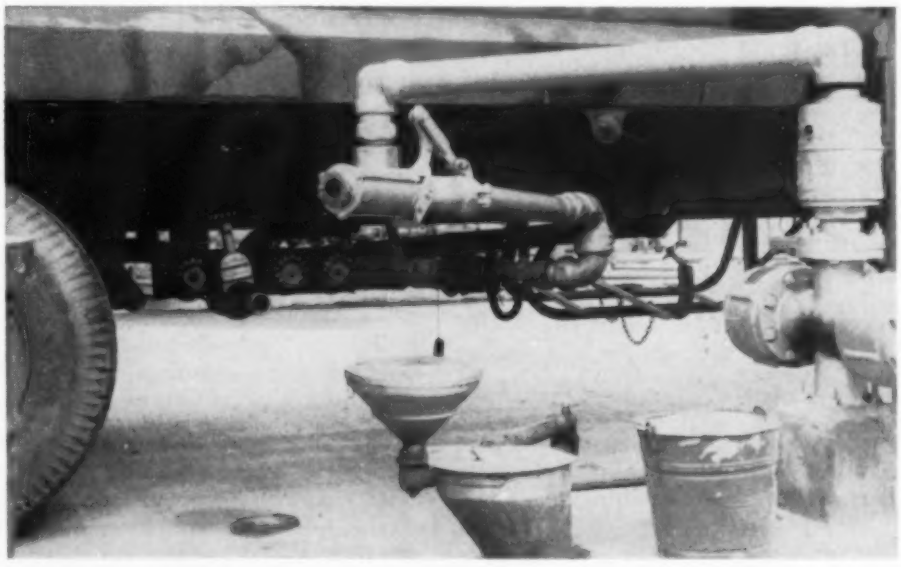
The rapidly increasing height of new transport trucks has made many overhead loading racks obsolete and has required new racks to be increased in complexity to meet safety requirements. The costs of loading racks have increased as these various items have been added. The Pure Oil Company introduced bottom loading to counteract the rising construction and maintenance cost of conventional loading racks and to improve the over-all safety in loading petroleum products.

The equipment required for bottom loading is simple when compared with platforms, steel structure, loading assemblies, bonding equipment and miscellaneous items which are being installed for over-the-top loading.

Bottom loading is being rapidly adopted in commercial aviation for handling the increased volume of turbine fuel and retaining its cleanliness and dryness as required by the jet aircraft. This new direct connected closed loading system is providing greater safety in the handling of this new aviation fuel.

Systems. The principle of bottom loading is good in itself, but to obtain its full advantages, it is necessary to have a system which will provide automatic shut-off when the required quantity has been loaded into the compartment of a transport truck. The prime objective in the development of equipment for bottom loading has been devices to control the quantity of product loaded. Many systems have been the outgrowth of the various trial installations.

The positive displacement meter which controls the quantity of the product as it is loaded by its pre-set



A closed system is obtained between loading facilities and tank truck through aluminum swing arm and quick-coupling, self-sealing valve.

Bottom loading facilities handling two products require a minimum of equipment.

counter and set-stop valve is one of the most practical systems.

The second system employs a control mechanism installed in each compartment of the transport to provide an automatic shut-off of the entering flow.

The third system uses a sensing device located in each compartment of the transport which produces a signal to an automatic shut-off device located on the loading island.

Positive displacement meter. Experience has indicated the metering equipment required at loading facilities can be utilized to provide the degree of control required. Meter manufacturers developed the pre-set counter and set-stop valve as an accessory to the positive displacement meter to control quantities of product loaded over conventional loading racks. This same equipment when applied to bottom loading offers a reliable method of operation. No greater number of overflows occur in bottom loading than in the conventional method when controlled by a positive displacement meter.

Control mechanisms. Various valves have been designed for bottom loading which provide automatic shut-off of loading flow entering compartments when a desired level is reached. There are two distinct methods of operation for which these valves have been designed. Under one method of operation the transport truck is equipped with separate loading lines and control valve which is used only during the loading operation. This operating principle has proven satisfactory in the loading of aircraft refueler trucks at airports, but when applied to over-the-road transport trucks, involves considerable cost.

Internal float mechanisms. The other method of operation requires the control valve to replace the existing emergency valves in the bottom of the transport compartments and perform the combined function of automatic shut-off during loading and can be manually operated for unloading. These various valves are available in different sizes which will permit loading rates up to 750 gpm.

The valve uses an internal float control system to actuate a balance valve to obtain shut-off. Experience being obtained is indicating the dependability of these systems. It appears that future bottom loading facilities may involve a combination of the positive displacement meter and automatic shut-off valves in the compartments of the transport trucks.

Sensing tubes inside the compartments. One of the early complete bottom loading systems available in the petroleum industry had control devices located in the compartments of the transport and the automatic shut-off device located at the loading area. Sensing tubes inside the transport compartments produced a signal through a coupled tubing to a diaphragm actuated valve which provided the automatic shut-off.

Arrangement of Loading Facilities. A practical arrangement of bottom loading facilities appears to be small loading islands which can be placed in parallel to accommodate the volume of loadings. An area 16 feet in length and 6 feet wide is normally sufficient to accommodate the facilities required at the island. Four products or more can be handled at a loading island which will permit loading from either side. Four-inch piping including meters and set-stop valves are used for the various products to obtain loading rates up to 500 gpm. The connection between the transport truck and the loading island is through a 3-inch aluminum swing arm arrangement or a 3-inch hose. A 3-inch quick coupler valve is used on the end of the loading assembly which connects with mating portion of the valve on the transport truck. The 7,000-gallon transports are being loaded from facilities of this design in about 15 minutes.

Future designs will use 6-inch product lines and meters with 4-inch loading assemblies and quick coupler valves to permit loading rates up to 750 gpm.

Self-Sealing Valve. Until a few years ago the main problem confronting bottom loading was the making and breaking of the filling connection without appreciable spillage. The product spilled at the loading area was not only a loss but a fire hazard as well. In some cases special piping

as used to empty the line before disconnecting.

But it was not until the advent of self-sealing quick coupling that bottom loading could be considered a practical method. The self-sealing quick coupling valve was originally developed for the aviation industry for underwing fueling. The military recognized need for standardization of the connecting portion to permit various manufacturer's valves to be interchangeable. The military standard three-lug adapter flange on the connecting portion of the coupler has great merit when applied to bottom loading of transport trucks in permitting any transport truck to be loaded at any loading facility regardless of the manufacturer's valve used.

Aviation refueler truck with automatic shut-off controls being loaded at 650 gpm. The author predicts 750 gpm hook-ups will be common in the future.

Justification. There are savings to be realized from bottom loading. A conventional four-product loading rack installed is estimated to cost approximately $40,000. Bottom loading facilities installed to handle the same number of products and transports is estimated to cost about $24,000 or a possible savings of approximately 40 percent. Simplifying the loading system and eliminating the steel structure with its required platforms and walkways have made this savings possible. Greater utilization of the loading area, less maneuvering of vehicles and an operation which is not affected by the variation in transport heights adds further justification to this operation.

New Efficiencies. The full advantages of bottom loading are obtained as it becomes a one man operation, carried out fast, safely and with automatic control from the ground level. The availability of equipment to obtain self-venting of the transport has assisted in fulfilling this requirement. The arrangement of bottom loading facilities permits both the operating devices of the transport and loading equipment to be at the same level, an advantage which could not be obtained in overhead loading. Less equipment is handled, and once coupled up, loading can be switched from one compartment to another by turning valves. All compartments are filled through a single connection, eliminating respotting of transport as occurs at an overhead loading rack. Facilities are now being designed with loading rates up to 750 gpm. The same loading rates obtained at over the top racks can and will be obtained in bottom loading.

Bonding. Bonding for static electricity is automatic as soon as the connection is made, eliminating the cost of bonding equipment and the problems of cables not being carefully attached. The potential hazard of generating static electricity charges which could cause an explosion is reduced by the completely submerged loading. This is of major importance in the handling of turbine fuels, kerosine, naphthas and other low vapor-pressured hydrocarbons.

Safety. Bottom loading, being a closed system, eliminates fumes being discharged in the vicinity of the loader. All of the required operations in bottom loading are performed at ground level eliminating accidents which occur from the top of the transport. These accidents have been fortunately rare, however, they are severe or even fatal. Personnel at ground level are not subject to the possible injury which can result from a hasty scramble from the top of the transport in case of fire or explosion. Crossings between loading rack platform and the top of transports handling heavy loading assemblies and operating loading valves have always been potential hazards which are eliminated.

Reduces Vapor Losses. There is a saving in vapor conservation during the loading operation. Since all loading is submerged, turbulence is minimized and venting may be under a slight pressure.

Bottom Loading Problems. Transports which operate from bottom loading facilities must be equipped with quick coupling, self-sealing valves and required manifold piping. It is normally desirable to install compartment venting which may require welding on the tank truck. However, if venting is not installed, the transport can be loaded successfully if the driver unlocks dome covers before loading.

Bottom loading is a new method of handling petroleum products and is a change from the "traditional" way of loading a transport so it is subject to normal resistance of change. It requires a new method of operation which involves training of personnel in new operating procedures and safety regulations. —**The End**

About the Author

W. L. Hunter is a senior engineer in the General Engineering Department of The Pure Oil Company. He was graduated from Northwestern University with a B.S. degree in mechanical engineering. He has served in various capacities with Pure Oil, including assistant superintendent of maintenance at the Heath Refinery. Hunter is a member of ASME, API and ISA.

French Pipeliners Cross the Sahara

Pipelining in the desert. Unloading double-jointed pipe from a giant stringing trailer. Note the huge spreader bar required to handle the long joints of pipe. While there were many difficulties associated with pipelining through the desert, right-of-way problems and overweight vehicles were not among them.

The Sahara ditched and ready for the pipe gang.

The 24-inch line from Hassi Messaoud to Bougie on the Mediterranean is complete. Another crude line is under construction and a gas line is in the engineering stage

By Donald M. Taylor
Engineering Editor
PIPE LINE INDUSTRY

FRENCH PIPELINERS have completed the 410-mile, 22- and 24-inch crude line from the lush oil fields in the central Sahara Desert to the Mediterranean port of Bougie. The line started up in November and now it is delivering 80,000 to 100,000 barrels of sweet crude daily from the Hassi Messaoud fields in Algeria. Only two of the stations are operating at this time, and when the remaining two stations are completed, daily capacity will be 310,000 barrels.

Financing. The French government and private enterprise have jointly financed the project from the start. To date, they have poured some $600 million into the development and exploitation of Sahara oil and gas fields. The object? In recent years, France has been spending some $350 million of hard currency per year on oil imports from the Middle East, South America and other sources. This drain has by no means enhanced the country's somewhat shaky economy, and the success of the bold venture into the desert is making sweet music to the ears of French economists.

From existing discoveries, engineers are estimating that oil reserves will run into billions of barrels and at least one estimate calls for about 30 trillion cubic feet of gas. When exploited, this is sufficient to supply the energy needs of France with ample hydrocar-

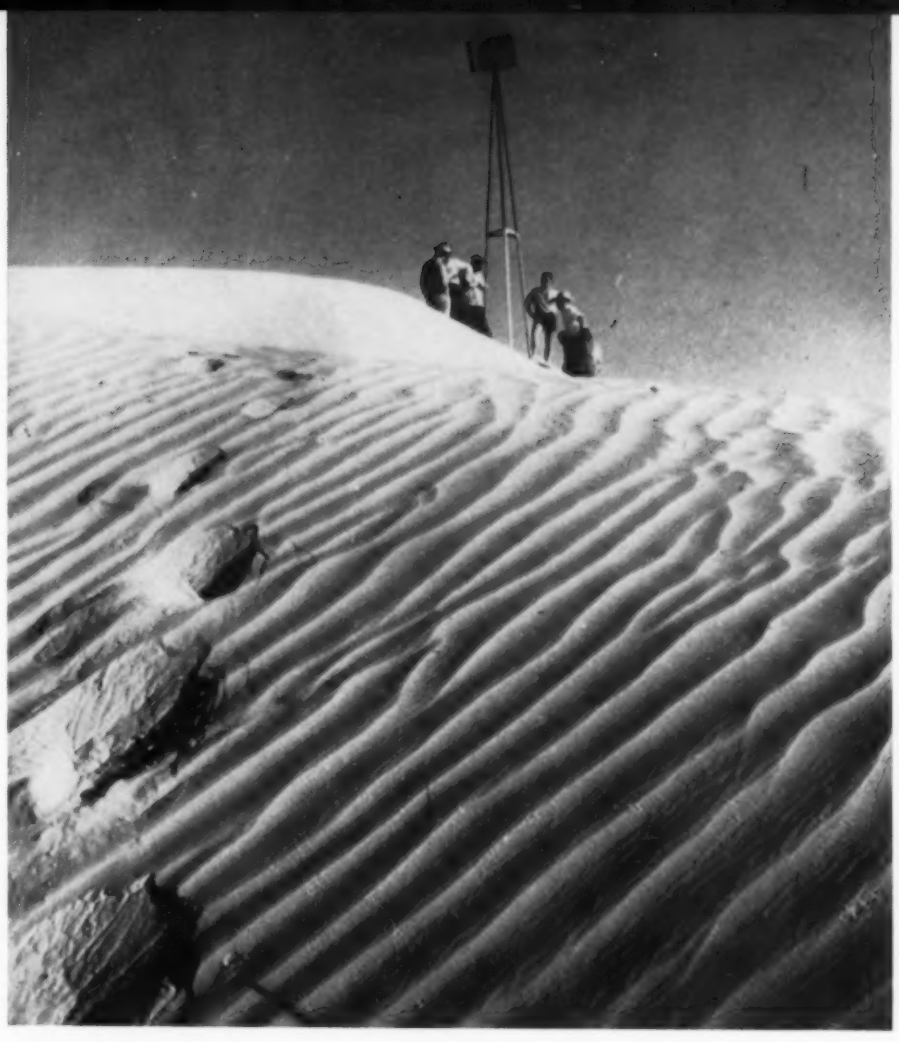
Desert

tions left over for sale to other West European nations.

French engineers are spending a lot of time these days devising means of bringing natural gas and crude to Europe by pipe line. At the same time they are watching the liquid methane shipment activities of American and British companies.

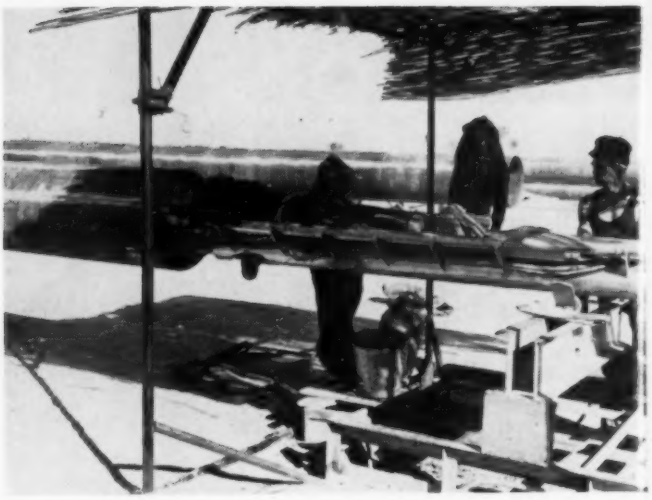
Crude, Gas Lines. Meanwhile they are shoving ahead with gas and crude transportation systems. The first line in the Sahara was completed in 1958. It was a 124-mile, six-inch line from the Hassi Messaoud field to Touggourt where it connected with a railroad running 225 miles to Philippeville on the Mediterranean coast. This system was able to deliver only a small portion of the crude consumed by France, but its political importance was considerable.

The second line from the desert was the Hassi Messaoud to Bougie line which will be operating full blast by the end of the year. Meanwhile, a



Mapping the route. Mobile camps made it possible to carry out such tasks without danger.

Clearing and grading right of way. Contractor on this $100 million line used 80 mobile vehicles and 60 stationary machines.



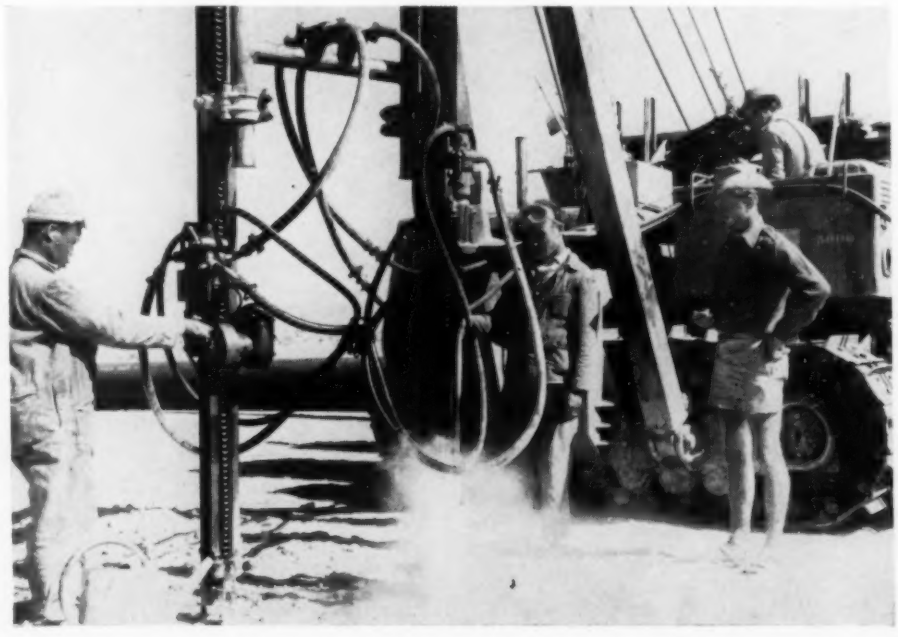
Double jointing operations with U.S. equipment. Note man on boom ready to enter the 22-inch pipe.

third crude line is under construction at this time. It is a 475-mile, 24-inch carrier running from fields near Edjele to the port of La Skhirra on the Gulf of Gabes. About 310 miles of the line lies within the borders of Tunisia.

In addition, engineering has been completed on a 320-mile 24- and 20-inch natural gas line which will run from Hassi R'Mel to Arzew. Its initial capacity without compressor stations will be 60 MMcf per day; with stations it is expected to deliver 440 MMcf/day. When this line has been fully completed, it will be necessary to find means of transporting most of its contents across the Mediterranean.

Hassi Messaoud Line. The cost of the Hassi Messaoud to Bougie line ran about $100 million. At this price it's a bargain. The logistics of the desert were difficult and the terrain near the coast was just about as bad as mountain pipelining in the United States.

As with many big deals, the ownership and contracting arrangement are complex. Partly this is an outgrowth of individual firm's efforts to spread the heavy risks. The owner-operator is SOPEG, which stands for Societe Petroliere de Gerance. But SOPEG in turn is owned 50-50 by Compagnie Francaise des Petroles and Societe National Repal.



Wagon drills in the desert. On the northern-most end of the line several million cubic yards of spoil had to be blasted and excavated to make way for the pipe.

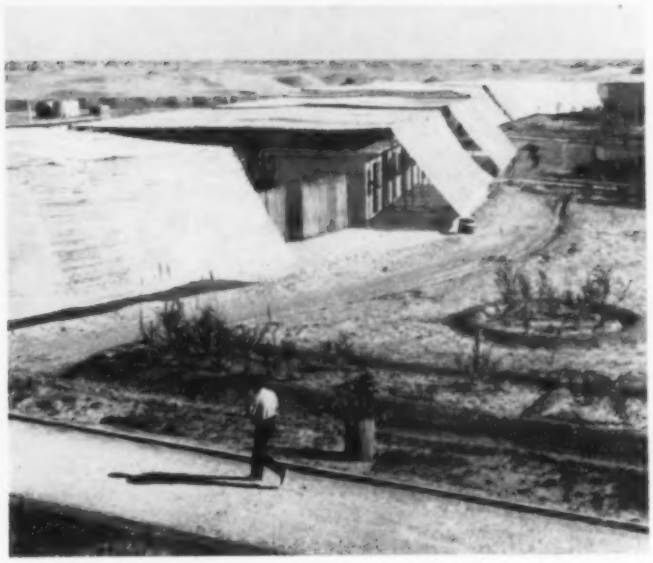
Prime contractors on the line were Compagnie de Pont-a-Mousson and two contracting subsidiaries, Eau et Assainissement and SOCOMAN.

Construction. While the desert presents many difficulties so far as pipelining is concerned, it does have several redeeming features. First, the right-of-way is no problem, and second, there is no limit as to the size trucks and other vehicles which can be used in construction. Trucks used on this job were among the largest in the world.

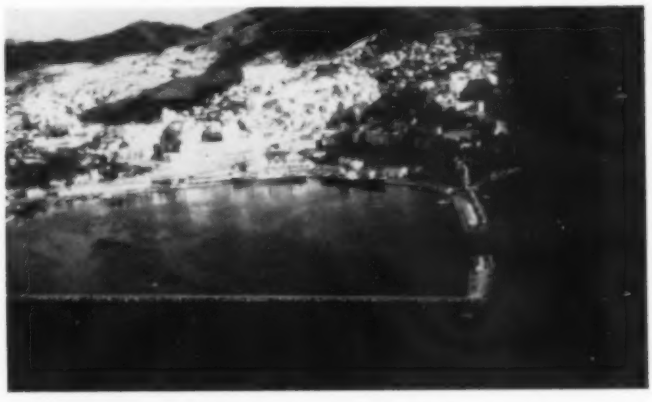
It was the northernmost part of the line that presented the most difficulties. To reach the coast the line had to cross over the Atlas Mountains, span the Selatna Pass at about 3,500 feet, and on the downward slope cross through the Portes de Fer—or Iron Gates. This rocky barrier has slopes on either side approaching 75 degrees, and many of the slopes through this area run about 32 degrees. In the last 78 miles, the line crosses the Azerou River 19 times!

The contractor used about 600 men on this phase of the job. Half of them were Frenchmen, the others Moslems. The men were mainly housed in two camps, one at Bougie and one at M'Sila, site of one of the system's pump stations. Ten auxiliary mobile camps supplemented the two permanent ones.

Most of the construction equipment used by contractors came from the United States. All told, more than 140 mobile or stationary pieces of pipe line equipment including welding ma-



Personnel quarters at Hassi-Messaoud camp. More than 300 trees have been planted to supplement man-made shade.



The small port of Bougie has been dredged to make room for sea-going tankers. When work on jetties is complete, the port will be able to handle five tankers at a time. Initially, eight 220,000-barrel tanks were erected to take care of incoming crude.

chines, trucks, tractors, ditching machines were used.

Pipe. The southern 332 miles of the line is 24-inch pipe and the northernmost 78 miles is 22-inch. It is tapered throughout; wall thickness varies from ¼ to ⅜-inch, and pipe is X-52 and X-42. Where feasible, it was double-jointed before stringing.

Stations. The line is designed for four pump stations. The first one is at Haoud El Hamra about 12 miles from Hassi Messaoud. It is an all-electric installation with four 1,800-hp electric motors.

The second station is still in the planning stage. Most likely it will be a gas-fired turbine, remotely controlled from Station No. 1. This station is located at Djamaa 126 miles from the origin of the line.

The third and fourth stations are diesel-engine driven with four 1,800-hp diesels apiece. Pipe line crude is used for fuel. Station No. 3 is at Ferme Durourg 95 miles from Station No. 2 and Station No. 4 is at M'Sila where there are warehouses, housing and a 13-room hotel.

Terminal at Bougie. The coming of the pipe line caused sweeping changes in this little port on the Mediterranean. First, its harbor was dredged; about 1½ million cubic yards of spoil was removed to make way for the big tankers. At present only one tanker can be loaded at a time, but when construction of two jetties is completed by October, five tankers will be able to load simultaneously.

Initially, eight 220,000-barrel tanks were erected to take care of incoming crude. Before the year is out this will be increased to 12, giving Bougie a storage capacity over 2 million barrels.

Oasis in the Desert. At the origin of the line, the crude from the gathering system is stabilized before it enters the pipe line system. The gas from the separators are used to provide lights, power, and services for a man-made oasis in the desert—Haoud El Hamra.

This miniature city has a plentiful supply of water—from water wells—and it literally sprang up like a desert mirage. It has houses, personnel quarters, a hotel and power plant. To date, more than 300 trees have been planted and 700 more will follow.

Future Sahara Pipelining. If this project is typical of other French activities these days, France will soon emerge as a major power in world industry. The enthusiasm, imagination and energy shown by the engineers and supervisory personnel on this job indicate that so far as they are concerned, the big race is about to start!

—**The End**

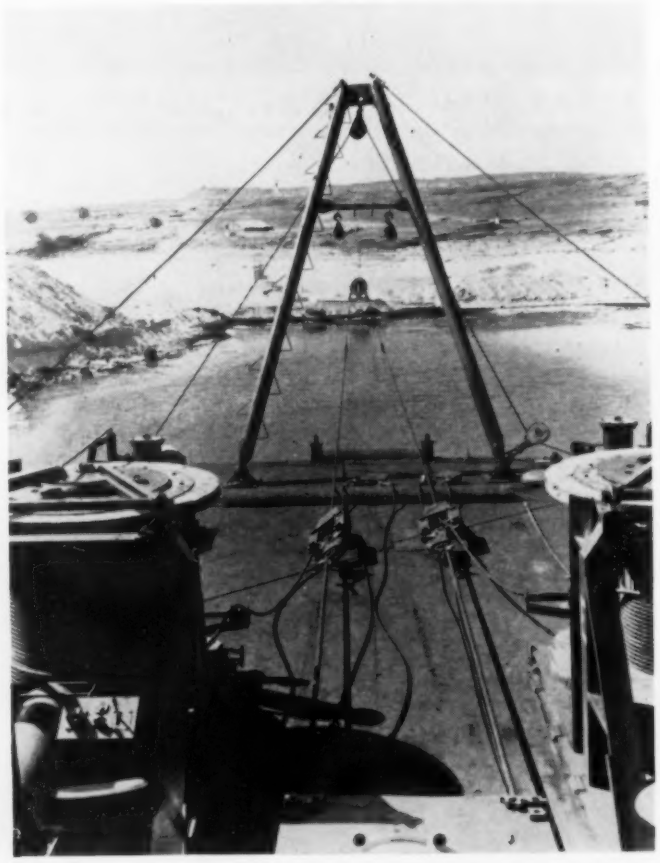
30-Inch Pipe Line Pulled Along Persian

The 30-inch concrete pipe enters the water from Khargu Island. The job consisted of two pulls—one from Khargu Island to Kharg Island terminal. The other ran from Khargu Island to shore near Ganaweh. This 19-mile-long pull traversed water ranging up to 160 feet in depth.

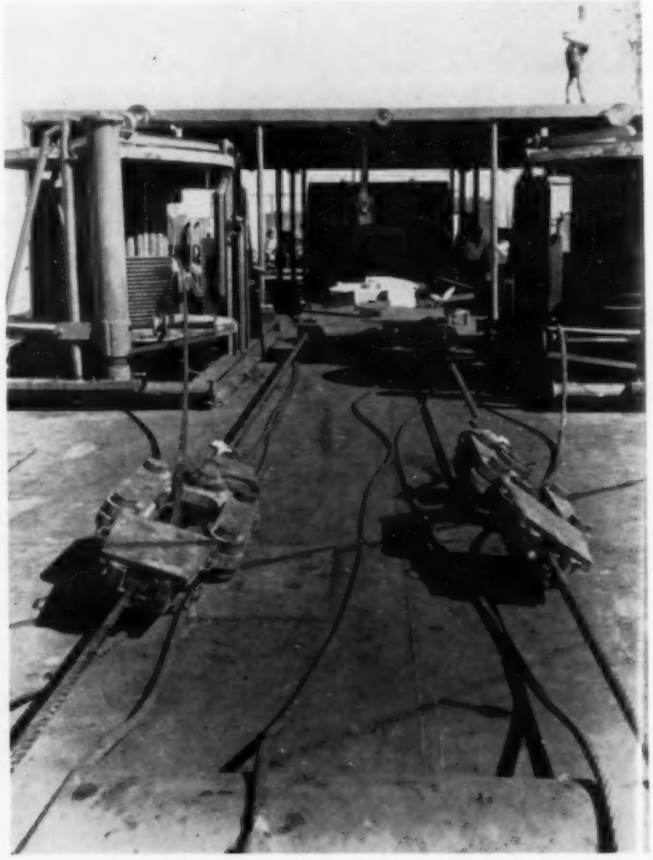
A 19-mile section was pulled through waters that ranged to 160 feet in depth

SOON CRUDE oil will flow by gravity from the Gach Saran oil field in Iran, 99 miles to a new sea-loading installation 25 miles offshore in the Persian Gulf. This is perhaps the largest gravity-flow set-up in the world. It traverses mountains, deserts and some 22 miles of Persian Gulf waters.

International Marine Constructors, C. A. and Collins Construction Co. undertook the marine construction of



Land anchors were used on friction transposition cables on both pulls. The short distance between the pull barge and land anchor on Kharg indicates the short pull is nearing completion.



This view of the pull barge shows the vertical spooling units, carpenter stops, equalizing block for anchor lines, and the rear of the pulling winch.

Gulf Floor

the 30-inch line, for Iranian Oil Exploration and Producing Company. The first phase of the work was a preliminary survey of the Persian Gulf area between the Iranian mainland at Ganaweh and Kharg Island. From the survey it became apparent that there were six feasible routes for the submarine lines.

Each of these six routes was carefully sounded and bottom cores were taken. From this information the final route was selected. It runs 19 miles from shore near Ganaweh to Khargu Island and three miles across water to the terminal on Kharg Island.

Base of Operations. Khargu Island was selected as a base of operations; and before construction began the logistics of the submarine pipe line were worked out. Pipe racks, launchway, pipe treating and coating facilities were installed. Near the shore a control tower was erected; radio communications, housing, recreation and first-aid stations were added. All of this material had to be barged in.

How the Line Was Pulled. The Collins friction transposition method was used in pulling the pipe line along the floor of the Persian Gulf. Actually, this is a simple and practical method of pipe line construction. In the past, on direct pulls, the weight and friction of the wire rope attached to the partially buoyed pipe required a greater pull than did the pipe itself. In other words, as more and more pipe entered the water, it required less pull at the winches across the body of water.

This method simply takes advantage of the friction and holding power of the heavy wire rope. A pull barge spools out twin wire ropes to anchors on the opposite shore from the pulling end of the pipe. Then backing across the water towards the pipe, the barge respools two drums of wire rope as it goes. At a specified distance from shore, the barge stops, clamps the two anchor lines, and sends the pulling hook to shore for the front end of the pipe.

The barge then winches the first

View from the control tower on Khargu Island shows the 4,000-foot string used for the Khargu to Ganaweh pull positioned on racks on the launchway. Crane in the background is placing the concrete forms while crews pour concrete using a transit mix truck. Air-operated vibrators attached to the sides of the forms were used to insure uniform density of the coating. Sideboom tractor at right is removing forms after the concrete had set.

Winch operator, at the winch control panel on the pull barge during the Khargu to Kharg pull. Two two-way radios are mounted on the panel for communications with the control tower and holdback winch on the launchway.

Triangulation towers used for positioning the pull barge were constructed on Kharg Island for the short pull and on the mainland for the long pull.

The buoyant block attached to the nose of the pipe arrives at Kharg, indicating the end of the short pull is near.

section of pipe out into the water. Then while the next section of pipe is being welded on, the barge pulls itself ahead on the twin anchor lines, and so on until the body of water has been crossed.

The decision to pull the line instead of stove pipe it was based on the depth of water (160 feet) and the high tides.

Kharg to Khargu. The first pull was the short three mile section between Kharg and Khargu islands. After erecting quarters, offices, and work area, the 30-inch pipe, which arrived at the site in eight-meter (about 26 feet) joints was welded into 4,400-foot-long sections and assembled on the racks adjacent to the launchway. All welds were X-rayed. The negatives were immediately developed and inspected. The pipe was then given its corrosion protection coating consisting of primer coat, one layer of coal tar enamel, one layer of fiberglass (placed on while the enamel was hot) another layer of enamel, another layer of fiberglass, and an outside covering of asbestos coal tar saturated felt. To protect this coating against abrasion and to provide the necessary negative buoyancy, a 2½-inch layer of concrete was applied, using a 4 x 4 No. 9 steel mesh for reinforcement.

The pull barge, equipped with a powerful winch was matched against a shore-based holdback winch on the island to maintain the correct tension on the pipe during the pull. As the pipe moved on the launching units, the dynamometer readings were checked to assure that the tension was maintained correctly so that the pipe was under positive control throughout the pulling operations. These restraining force figures were relayed to the control tower and the pull barge.

Khargu to Ganaweh Pull. The 19-mile record breaking pull between Khargu and Ganaweh was launched in 4,000-foot sections in much the same manner as the initial 3-mile sector of the job. After installing a massive land anchor on the mainland, the pull barge headed toward Khargu, reeling out lines from a pair of spooling devices. Near the island, the unreeling was discontinued, and a loop from the double drum barge winch was unreeled and pulled to shore. Here it was looped around the sheave on the buoyant block at the forward end of the pipe. Assisted by the two anchor lines on the reel, the winch pulled the first section of pipe line into the water.

At this point, pulling was interrupted while another 4,000 foot of pipe was tied in on shore. At the same time the pulling barge backed up 4,000 feet into the water by coiling in the anchor lines. When this was completed, the winch made another 4,000-foot pull of pipe, and the procedure was repeated, until the pipe line was brought ashore on the mainland near Ganaweh, completing the nineteen mile section of 30-inch pipe. The pull barge was kept on line by the use of theodolites controlled from the 86-foot control tower on Khargu, and two other triangulation towers located on the mainland.

Equipment for the job was sent from the United States to the Persian Gulf by barges, constructed for the job in Texas and Louisiana. Included in the equipment on the barges were two crew boats and one tug boat. Another tug sailed to the job under her own power. —**The End**

Latest Techniques in Cleaning Lines With Detergents

The best method seems to be a combination of detergent solutions and wire brush pigs

By J. N. White and A. Bartoszek
Panhandle Eastern Pipe Line Company
Kansas City, Mo.

FOR BEST EFFICIENCIES, pipe lines should be clean and smooth inside. Where internal coatings have not been used, the flow efficiencies can be greatly enhanced by cleaning. Seemingly, the best technique for cleaning is to use a combination of detergent and wire brush cleaners.

The two main factors affecting the efficiency of any section of pipe are the inherent roughness of the pipe wall and any accumulation of foreign particles of dirt, dust, oil etc. on the pipe wall. Either of these conditions can lower the flow efficiency—requiring more horsepower or greater pressure differentials to push gas through the line.

The most effective and economical time to control both of these factors is during the construction of the line. This point cannot be emphasized too strongly. The roughness of the pipe wall that may result from weathering during storage prior to construction may affect the efficiency of the line throughout its lifetime. The same can possibly hold true for the construction dirt accumulations if they are not removed.

Once a line has been cleaned and placed in service, the best method of maintaining efficiency is to control the quality of the gas transmitted in the line. But this is not always possible, and it may become necessary to effectively clean the pipe line from time to time to restore efficiency to its original level.

The two methods of cleaning are on-stream and off-stream cleaning. The latter can be further broken down into dry scraper cleaning and detergent cleaning. The method chosen for a particular job will, of course, have to be adaptable to the existing features of the individual pipe line system. The on-stream method is usually the easiest and most desirable, providing the proper facilities are available. Before taking any line out of service for cleaning, certain things must be considered:

- Line characteristics and availability
- Cost of cleaning

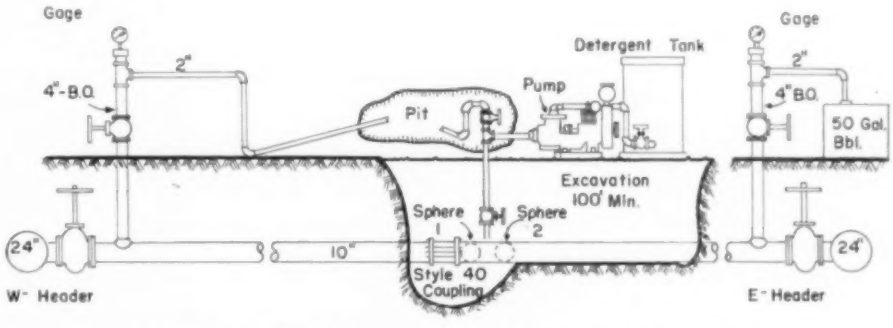


FIGURE 1—Piping arrangement for river cleaning (typical).

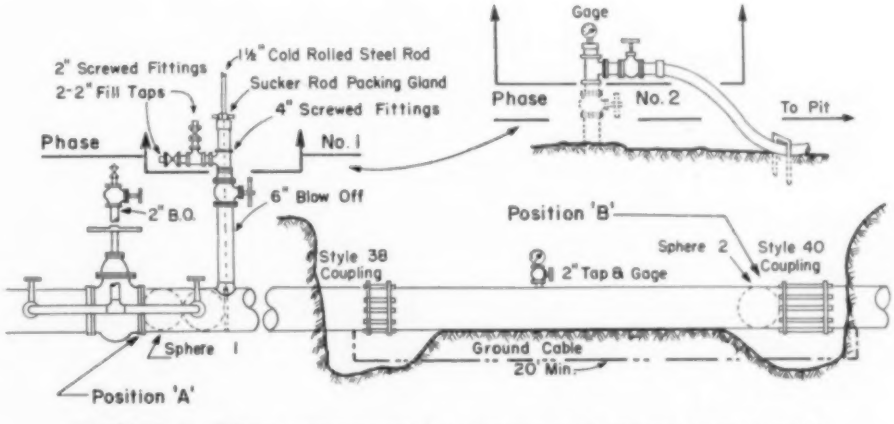


FIGURE 2—Piping arrangement for cleaning with spheroids and liquids.

FIGURE 3—First step in actual cleaning of line section is detergent fill. Here, gasoline is delivered by tank truck into the blow-off piping.

- Frequency and type of contamination
- Expected increase in efficiency due to cleaning

Choosing between the dry wire brush type cleaning and the detergent method will depend, to a large degree, on the type of contamination and the most economical means of removing it. If the pipe wall is dry, dry pigging will suffice. In addition to doing an excellent cleaning job in dry pipe, repeated runs of dry-brush pigs burnish the walls of the pipe, somewhat improving the pipe's resistance to future contamination.

The detergent method should be used if the contamination on the walls of the pipe is wet with oil, glycol, or other liquid carryovers from the wells, compressor stations or treating plants. Any pipe line cleaning should be based on the initial efficiency of the line, and the trend of subsequent efficiency studies established by periodic flow studies. The flow studies tell us whether or not a line is as clean as it should be. It is only from these studies that we can evaluate any cleaning method.

There is considerable variation of detergent type cleaning methods among companies within the transmission industry. The existence of this variation indicates that the gas industry has not accepted a so-called standard detergent type cleaning method and is still looking for improved methods and results. Here are the methods of off-stream detergent cleaning used by Panhandle Eastern Pipe Line Company. Three examples of detergent cleaning are included.

Last year Panhandle Eastern made several improvements in cleaning techniques as applied to its own system. The very first cleaning job of the year involved a multiple river crossing. This crossing consisted of six 10⅝-inch lines, 1.12 miles long. This crossing was quite low in efficiency. Short radius 45° bends prompted us to search for a different method of cleaning other than the conventional squeegees and wire brush cleaners. Neoprene spheroids provided the answer. They were used to contain the liquids in the same manner that squeegees had been used in previous years.

Panhandle Eastern had previously used the spheroids for water removal on a small diameter line following a hydrostatic test and the results were all very favorable. One of the main advantages of the spheroids, in addition to the fact that they can traverse very short radius bends, is the fact that they can be propelled equally well in either direction. The combination of liquid detergent type cleaning fluids and the spheroids eliminated the need of a separate receiving joint because the insertion and removal of the spheroids can be made at one point, and the liquid removal made at either end by using existing branch connections.

Here is the method used in cleaning the six 10-inch lines: Sodium orthosilicate and water solution was used on five of the lines and drip gasoline was used on the sixth. The typical set-up for the cleaning of these lines is shown in Figure 1.

After the initial preparations were completed, then one line at a time was taken out of service. The excavation had been made large enough at the one end of the section to be cleaned to permit sufficient "slack" in the line, whereby with one "cut," the line could be lifted to insert the spheroids. The 2-inch tap was installed prior to cutting the line. This was located approximately one foot from the "cut." One 10-inch spheroid was sized and placed into the line downstream of the tap connection. Another 10-inch spheroid was sized and placed into the line upstream of the 2-inch tap connection. The pipe was then lined up and connected with a coupling. A tank, containing a solution of 100 pounds of sodium orthosilicate and 700 gallons of water, was agitated by hand and then pumped into the line with a 1½-inch centrifugal pump connected to the 2-inch tap. The only preparations at the opposite end of the line were to connect piping from the blow-off connection to a container.

The slug was then moved from the point of insertion to the opposite river head. The travel time was approximately ten minutes, and approximately 15 psi pressure was required to make the run. When the slug was received at the opposite header, the gas was shut off at the starting end and the pressure blown down. As soon as the pressure was reduced to zero pounds, the slug was then returned to the starting point and removed through the 2-inch and 4-inch blow-offs that were piped to an open pit. A rinse run of a similar quantity of water was made after each detergent run on the five lines where sodium orthosilicate was used.

Gasoline was used as a cleaning agent on the sixth line, using the same procedure as the detergent and water. The main reason for wanting to try

FIGURE 4—Inflating the "pig". Sphere is sized for proper fit in the line section using water and a hand hydrostatic pump.

FIGURE 5—Spent gasoline laden with oil and dirt is confined in this pit after completing a cleaning run through section of Panhandle line.

the gasoline on one of the lines were:

- Gasoline was readily available in this area,
- It is known to be one of the best solvents for any hydrocarbon deposits,
- Cost of the gasoline available was very favorable,
- Any residual gasoline left in the line would have no harmful effects on the dew point, as is the case of water left in the line.

The disposal of gasoline at this location was not a problem. Two 700-gallon slugs were used in the line cleaned with gasoline. The gasoline run proved quite successful and its use was not considered dangerous if handled with proper precautions. The results, using the gasoline as a detergent, were identical to the results using the water and sodium orthosilicate.

The successful results of the gasoline cleaning on the 10-inch river line prompted us to program three 24-inch main line sections for further experimenting with gasoline cleaning. The three sections selected were 8, 11, and 11 miles in length respectively. A slightly different method was planned for each section.

- **Section 1**—Load 12,000 gallons of 18-pound gasoline between two spheres and move the slug to the far end of the section. Then return it to the inserting end and dump it into the pit. The first run was to be followed by a rinse run, using the same quantity of gasoline and the same procedure of running.
- **Section 2**—The same procedure was planned for the second section, except that a wire brush cleaner would be used in the slug between the two spheres on the first run. The procedure for the rinse run was the same as that used in Section 1.
- **Section 3**—The same procedure used on Section 1 was planned for the third section; however, cleaners were to be run through the section after the gasoline run. The line preparation and loading procedure were the same on all three sections. A 20-foot section was excavated at the inserting end to insert and remove the spheres. A 2-inch tap was installed on this 20-foot joint. The joint was coupled at both ends for easy removal and replacement. The joint was first removed and one rubber sphere was placed in the line and the joint replaced. This sphere was then moved up against the block

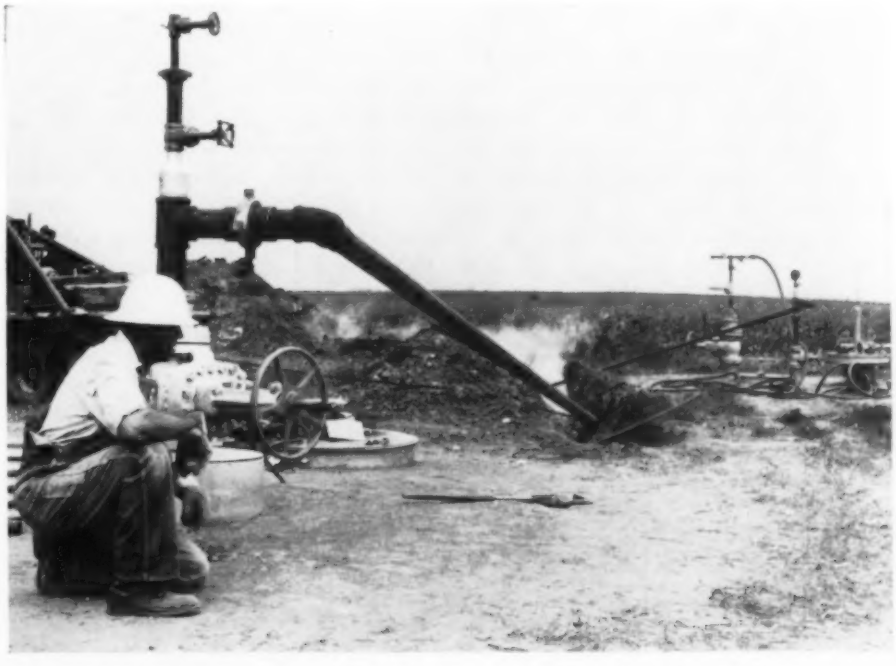


FIGURE 6—Discharge piping at end of cleaned section carries spent gasoline to pit, minimizing fire hazard or damage to surrounding area.

FIGURE 7—"Salvo." Lead cleaning sphere is caught in mid-air by photographer as it is expelled from line upon completion of cleaning run.

gate. The joint was broken again and the second sphere was inserted. The gasoline was then pumped into the line through the blow-off between the two spheres. Figure 2 shows the typical piping arrangements for cleaning with spheroids and liquids.

The gasoline used was hauled from the company gasoline plant to the job site by contract tank trucks, with a capacity of approximately 6,000 gallons each. Natural gas pressure was used to force the gasoline from the tank truck into the pipe line. The time required to load the gasoline into the pipe line was approximately 30 minutes. Connections were made to the blow-offs on each end, so that any gasoline removed from the line could be piped to a pit away from the line. The slug moved through the line very well with a differential of approximately 5 to 10 pounds. The rate of travel was regulated to approximately 8 to 10 miles per hour.

When the slug completed its first pass through the line, the pressure was then blown down behind the slug, and gas was taken from the opposite end to return the slug to the inserting end, where it was dumped in the pit. The spheres were removed from the line after the first run, then resized and re-inserted in the line as before, and another load of gasoline was pumped in between the two spheres for the rinse run.

The same procedure was used in loading and moving the slugs through the line on this section and on the other two sections. The only difficulties encountered on the three sections was that the cleaner became lodged once on the second section, but it was soon started up again by backing it up a short distance and starting out again. The first run on the third section was made in only one direction, because the spheres came in sooner than anticipated and the connection was not yet made to the blow-off to pipe the fluid into the pit. The gasoline started coming out the blow-off and we couldn't get to the valve to get it shut off. These were the only two difficulties experienced on the three sections. Table 1 gives the results of the gasoline cleaning operation conducted by Panhandle Eastern in 1959.

TABLE 1—Results of 1959 Detergent Cleaning (Gasoline)

Pipe OD Inches	Section Length Miles	Efficiency Percent		
		Before	After	Increase
(a) 24 Inch	8.52	83.9	84.2	0.3
(b) 24 Inch	11.64	84.3	88.5	4.2
(c) 24 Inch	11.50	81.3	89.9	8.6
(d) Six-10 Inch (Parallel)	1.12	76.8	80.9	4.1

(a) 2—Rubber Spheres
2 Gasoline Runs (12,000 gal.)
(b) 2—Rubber Spheres w/cleaner
2 Gasoline Runs (12,000 gal.)
(c) 2—Rubber Spheres w/6 cleaners after
2 Gasoline Runs (12,000 gal.)
(d) 2—Rubber Spheres used with 5 lines cleaned with Sodium Orthosilicate; 1 line with 18# gasoline.

The following observation and conclusions are offered as a result of our experience with detergent cleaning.

• Our present procedures are not adequate for cleaning a 40-mile section. Better control and results are obtained by cleaning shorter sections.

• Detergent cleaning alone does not appear to give the desired increase in efficiency. It is our opinion that supplemental runs should be made with wire brush cleaners, either before, during, or after the detergent.

• There is very little hazard involved in using detergents, including gasoline, when proper precautions are taken. In fact, the fire hazard is reduced by this type of cleaning on lines containing iron sulfide.

• The cost per mile for cleaning with detergents is equal to, or slightly less than, the cost of cleaning with conventional dry wire brush cleaners.

Our goal is to perfect this type of cleaning to the point where we can receive the desired results more economically and safer than the present conventional methods of dry scraper cleaning.

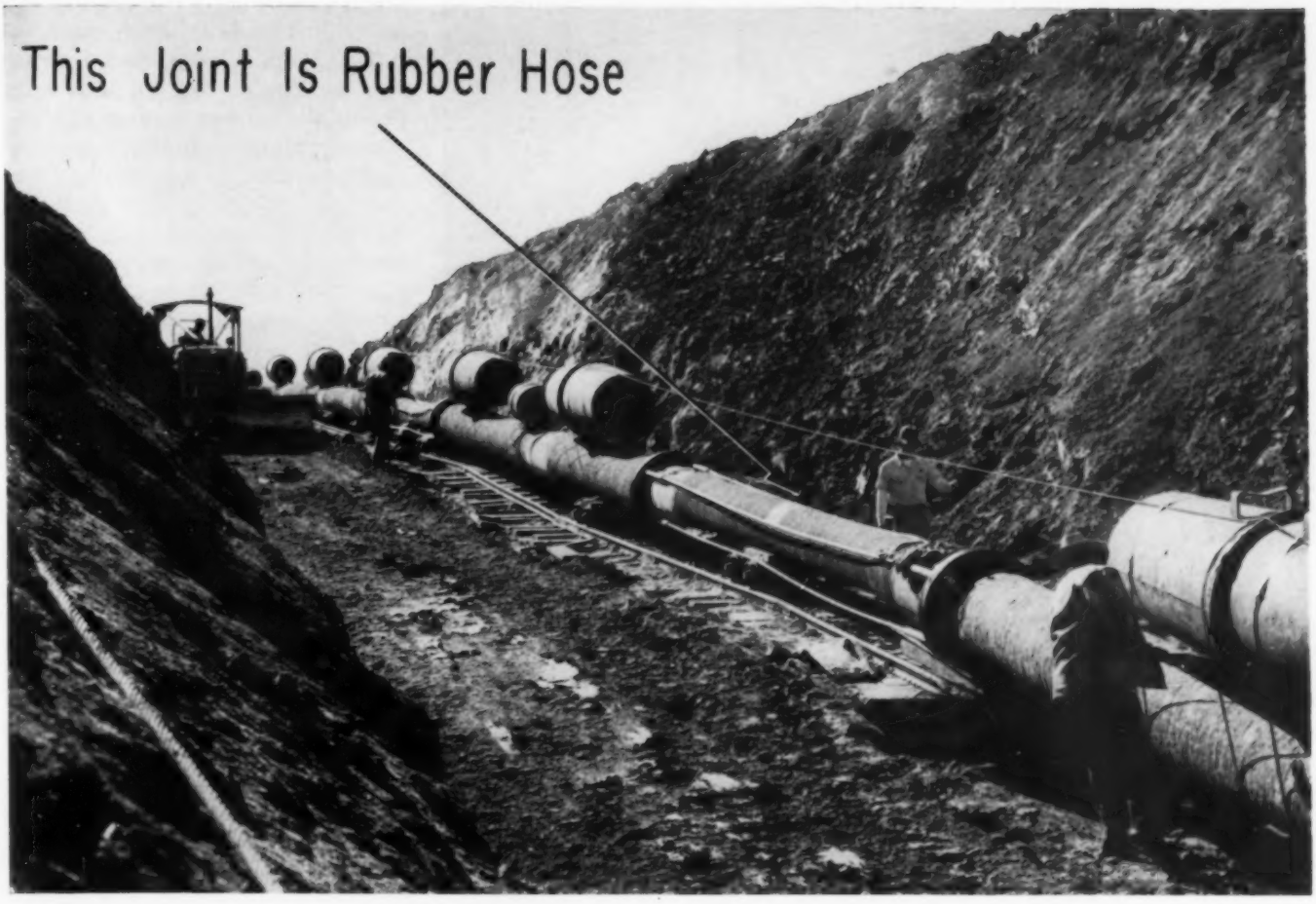
ACKNOWLEDGMENT

From a paper presented at the Fourth Annual Natural Gas Pipeline Institute, Liberal, Kansas, Nov. 17-19, 1959.

About the Authors

J. N. White (left) is superintendent of pipe lines for Panhandle Eastern Pipe Line Company. He joined Panhandle in 1949 after graduating from the University of Kansas. He worked in the Engineering Section as a resident engineer and as an inspector on construction. He became a pipe line division engineer in 1951. He was promoted to superintendent of pipe lines in 1956.

A. B. Bartoszek (right) is an operations engineer in the Pipe Line Section of Panhandle Eastern Pipe Line Company. He was graduated from Michigan College of Mining and Technology in 1949 and joined Panhandle in 1951. He started in the Engineering Section, later transferred to the Pipe Line Section as division engineer. He was promoted to his present position in 1955.



Red River crossing—made up of rubber hose alternating with 20-inch concrete coated pipe inches down into river supported by mine trucks on tracks. Rubber hose joints are 16-inches I.D. with 2½-inch walls. Hose is designed for 1500 psi pressure.

What's New in River Crossings

The most unusual crossing—rubber joints of hose alternating with sections of 20-inch pipe were used to cross the Red River

By **Louis I. Pentzien**
President, Pentzien, Inc.
Omaha, Nebraska

EVERY MAIN line river crossing is unique. The current differs, the banks, the type of soil, depth and history of the same river may vary from mile-to-mile, and to properly design and construct a crossing these and many other individual factors must be sized up and weighed. Engineers who fail to make allowances for the relevant factors may well fail in their task. Contractors, too, must plan each crossing on an individual basis, keeping in mind that the method which worked well on the crossing before, may fail on the current one.

Sometimes unusual circumstances may initiate sharp departures from conventional designs and construction practices. Such was the Columbia Gulf Transmission Company crossing of the Red River near Alexandria, La. The U.S. Corps of Engineers had ruled that no dredging in the river proper would be allowed in the vicinity of the crossing site, because it would likely interfere with a bank stabilization program which was being carried out. However, the bank approaches could be dredged for sag-bends and over-bends back of existing lines.

To gain the flexibility necessary to cope with the changing bottom of the river, the pipe sections were alternated with rubber hose. Usually three joints of 20-inch pipe were welded together and connected with a 20-foot-long length of 16-inch ID rub-

Close-up of one of the rubber hose joints. Note the large diameter wire rope which protects the hose during pulls. These lengths of rubber hose were alternated with the 20-inch weight-coated pipe.

The pipe and hose come ashore. The pontoons will be removed by pulling on the cutter cable which runs beneath the bands which hold the pontoons to the pipe.

ber hose. The latter was rated at 1500 psi and it had 2½-inch reinforced rubber walls. Calculations indicated that the flexibility of the hose would permit the pipe to assume any position, elevation or contour when and if there should be any changes from the original river bed conditions. Although the hose is costly, the economics of the design seemed comparable from a monetary and from an efficiency, operating and maintenance standpoint, with a line laid by dredging. Installation took only half the time normally required; and to speed operations, the hoses arrived from the factory already sleeved-over a length of pipe on each end and cemented to prevent any loss of gas or liquid products at the connection. This also provided a safety factor against an internal pressure in the hose or its connections greater than in the pipe sections themselves.

Special collars were attached to the steel nipples at both ends of each rubber hose. Four steel cables, one on top, one on bottom and one on each side, were strung from the collar at one end of the hose to the collar at the other end. This precaution was designed to avoid any possibility of a rupture in the rubber hose when pulling the entire line across the river. The pulling system was used without damage to the hoses, their connections onto the pipe, or to the pipe line itself. The line has been in service for over a year and is functioning satisfactorily, primarily as a stand-by line.

Important factors governing pipe line river crossings include bank material, dredging and right of way.

► **Bank material.** The most important single factor in conventional pipe line river crossings is the make-up of the materials found in the river bed and banks. After competent engineers analyze this material, which may be fine sugar sand, gumbo, clay, coarse gravel, solid rock or combination of these, the economics of the project and the equipment available will determine the logical excavation procedures.

► **Dredging.** Unlike ordinary pipe line work, where the size of the pipe has a great bearing on the amount of material to be removed, excavation of a "wet" ditch for a river crossing is not greatly influenced by pipe size. Approximately the same amount of material will have to be removed for a 6-inch as for a 30-inch line. If

excavation can be handled with a plain suction dredge or a cutter-head dredge, the costs will naturally be lower than for the removal of rock and slate formations.

Excavation of the latter likely will require drilling and shooting. In addition, some type of floating plant—a shovel or dipper dredge—may be necessary to remove the blasted material. However, the excavation work in rock is of considerably less volume and the ditch maintenance is less troublesome than in the case of sand and gravel. Because of the natural angle of repose, the volume of sand and gravel which must be removed to maintain a ditch of considerable depth is extremely high. Too, wash-ins or cave-ins must be removed just prior to laying the pipe to prevent spans.

Of the larger rivers, the Missouri, Mississippi, Arkansas and Red River are good examples of where either plain or cutter-head dredges can be used. But rock formations in the Ohio, Cumberland, Tennessee, Monongahela and Susquehanna rivers may require drill barges, and drilling and dynamiting.

Originally when rock was encountered, the old churn-drills were set up and the slow hammering process begun. It was not uncommon to hit stratum where no progress was made, or where a foot an hour was considered average. But with more and more undercrossing work came the introduction of air drills, which have increased the efficiency of operations such that as much as a foot per minute is not uncommon.

As a rule, the rock is covered with mud, sand and gravel, and for this reason, drills must work inside a drill-casing pipe. This is usually sized an inch or two larger than the drill bit; and as the drilling begins, the drill casing is literally jetted down until it rests on the rock and shuts off any alluvial over-burden.

Bits ranging in size from four to six inches with carbide inserts are generally used. When the hole is complete, the bit is removed without disturbing the casing, and a loading casing is inserted. Then the drill casing is removed and an adjacent hole started. While there are many theories on drilling adjacent to holes which have been loaded, a good safety practice is to keep three or four empty casings between a loaded hole and the one being drilled.

With respect to depth, bank ap-

A 30-inch Tennessee Gas crossing of the Tennessee River near Florence, Alabama. Dredging continues ahead of pipe to insure a clean ditch.

Mississippi River crossing near Hastings, Minn. on Northern Natural's Duluth-Superior 24-inch extension. Note the spoil in the river.

Typical shore launching set-up for large diameter gas pipe line crossings. Preparations were being made for the pulling of one of Midwestern Gas Transmission Company's two 30-inch main lines across the Ohio River near Owensboro, Kentucky.

proaches, locations of over-bends and sag-bends, and possible future erosion of banks and river bottoms, it is not surprising that there are as many different theories as there are companies. Indeed, even more, since there are usually differing theories within each company. Minimum standards are basically set out by Army Engineers and other local governing bodies, and any elaboration on them is always welcome.

► **Right of way.** Another factor to be considered in river crossings is that of the accessible right of way or working area. At some locations, low banks with acres of flat working area afford an ideal situation for making up river crossings into long pull sections. At another site, steep banks or a rock bluff—perhaps with a railroad track running adjacent to the river bank—may necessitate a ramp barge or stationary ramp.

In the pull method, the pipe is welded into sections, preferably as long as possible; a heavy-duty pulling winch on the opposite bank, securely anchored to large dead-men, slowly pulls the pipe across the river bed. The winch should have a working capacity to accommodate approximately 7,000 feet of 1½-inch cable. The pull may be from a single, two-part or four-part line depending on the distance and ease of pull desired. It has been the practice of Pentzien, Inc., to use between 1-inch and 1½-inch cable.

Although the negative buoyancy or dead weight friction drag of the pipe is reduced considerably for the pull, and the breaking strength exceeds that normally applied, extreme caution must be exercised since the pipe lies in a pre-excavated ditch as it is pulled across. Any underwater force may make it dig into the side of the ditch, creating a sudden and extreme pull. Because of the size of the pulling winches, these sudden pulsations are rarely noticed by the operators; and in order to maintain a uniform line pull, it is necessary to insert an accurate weight indicating device in series with the pulling machine.

It is very important to *"scale"* the line pulls when resuming after shutdown; that is, down-time that may have accrued due to welding on more sections, or that which occurs at the end of a work day. It is during these stops that the pipe may tend to "sand-in" or become seated in the soft river bottom. When this happens, the pipe must be given an opportunity to become dislodged before too much force is applied. After the pipe is entirely across the stream and in its proper place in the prepared trench, the buoys or other assisting plant may be released and removed; and the back-filling of the trenches begun. The tie-in to the main line can now be effected. —**The End**

About the Author

Louis Pentzien is president of Pentzien, Inc., and Pentzein Canada Ltd. He was graduated from Chicago Technical College of Engineering in 1913 and returned to his home in Manitowoc, Wis., to form a partnership in engineering consulting. He later joined the U.S. Corps of Engineers and learned about river crossings. Since that time, he has laid crossings under most major rivers in the United States. He is a registered professional engineer.

HOW TO REMEMBER PART 1

Sharpen Your Thinking Habits

It stands to reason that you can't forget something if you never really learned it in the first place. Therefore, practice these techniques of learning in order to develop your power of retention—and remembering

By John D. Quinton, Training Department
Tennessee Gas Transmission Company, Houston

IT SEEMS that everyone would like to improve his memory. Some want to remember the wife's grocery list. Party-goers want to remember the names and faces of those that they "had one for the road with." Preachers, salesmen, and public officials strive constantly to "improve" their memories.

Throughout the business world men and women are constantly harassed (so they say) by a "poor" memory. Annually, thousands of words are written by, and hundreds of publications are bought from, authors who promise a quick and easy method to "improve your memory in ten easy lessons."

But let's pause for just a moment to take a look at this popular thing called "memory." Let's see just what it is and determine, if possible, if it can be improved.

The word "memory" is a very general term that we use when we really mean remembering, recalling, recognizing and retaining past experiences. It follows, then, that to keep or retain something in our memory, the material will have had to be experienced or "learned" previously. However, if such material has been learned and all of it cannot be remembered then some "forgetting" has occurred. Forgetting, of course, is our failure to retain what we learned. Like memory, forgetting is a part of the process of learning. Therefore, to get some insight into this "memory" subject, we have to consider it in three different phases. These are:

- Learning
- Remembering
- Forgetting

LEARNING

Everything we have stored in our "memory" has come through a continual process of interaction with our environment. The ideas we have, the knowledge we possess, the accumulation of facts and fantasy, come under the heading of the process of learning. Consequently, the first step in improving your memory is to improve the learning process. There are a few methods and techniques of learning that will, if practiced, help you retain whatever it is you want to remember.

But keep in mind that it is impossible to develop an entity called "memory." What you will really be developing are methods and tech-

"If at times you can't remember a person's name after just being introduced, it's because you are trying too hard to make a good impression—you are concentrating only on yourself."

niques of learning that will facilitate retention and the result will be a "better memory."

1. We Remember What We Want To Remember. To learn something we have to "pay attention" to it. When you want to know the time of day, you will be more apt to notice a clock in a nearby service station and miss other subjects such as colors and objects. On the other hand, if you wanted to know the temperature, in searching for the thermometer, your eyes would probably skim right over the clock without even noticing the time. So, if we wish to remember something we must first want to remember it and in the process we must give it our concentrated attention.

As an example, when meeting someone for the first time we must sincerely pay close attention to the name and face if we wish to remember them. Many times we do not remember the name simply because we are trying to make a good "first impression" and our concentration is on ourselves. The stranger's name never makes an impression on the mind and later when we try to remember it we admonish ourselves for "forgetting" the name. But then how can one "forget" a name that was never learned in the first place?

Besides, what better first impression can you make than to remember the stranger's name, face and background? Pay close attention to these and you will learn them, or, in other words, commit them to memory.

Just attending to some facts, such as names and faces is not enough, however. We must also have the *intent to learn* them. There are many things that we read (attend to) but never learn or commit to memory. Don't look now, but after several years of use and many reproductions, can you recall your Social Security number? Now try to recall your armed service serial number. Facts, such as the serial number, that are intentionally learned are much better recalled than the others.

In remembering names and faces it will pay to remember these six simple rules.

First. Insure that the name has been heard correctly, repeat it and, if necessary, spell it. The owner not only can correct you if it is pronounced or spelled incorrectly, but will be pleased that you are interested enough to get it right.

Second. Write it down later if you wish to make a firm neural impression, for we tend to remember things we see better and longer than those we hear.

Third. If, at a business meeting or social gathering, names are mumbled and given too rapidly, take the time later to introduce yourself to those you want to remember, getting their names correctly. If it is inappropriate to seek out each person individually, you can obtain their names from an associate who knows them.

Fourth. It will help if you learn something about the individual's personality. This connection between name and personality will make a lasting impression. Some people feel that it is helpful to connect the name of a stranger in some outlandish way, as Mr. Cypress might remind us of a swamp. Such bizarre and illogical connections are not nearly as effective as a logical connection of name and facts about his personality. Besides, the next time we meet Mr. Cypress we might call him Mr. Swamp.

Fifth. You can remember names better if you say them aloud. Therefore, a name should be repeated in conversation to its owner and others as often as good taste permits. Begin and end sentences with the stranger's name. Not only will you learn his name, but he will learn yours—for, by using his name, you have made a lasting impression in his mind, too.

Sixth. In recalling an individual that you met at Joe's party or some important business meeting, don't think of him as "the fellow who had the facial scar," but rather think of his name.

2. Look for Meaning. Words that we use are merely symbols that represent the original objects. For example, the symbol "apple" has no meaning to a child that has never been shown an apple and instructed that it is an "apple." Only after the child connects the *word* "apple" to the *object* "apple" does the word take on meaning.

In addition, when the child sees an apple for the first time it has no gustatory significance whatsoever. But after he eats an apple, we find that the sight of the apple alone becomes sufficient to cause a flow of saliva—to make his mouth "water." Later the child learns that the symbol "apple" stands for this wonderful object he has been eating and then his mouth "waters" when he hears the word (or symbol) "apple." The symbol now has "meaning." Thus, words become substitute or symbolic stimuli, replacing objects, ideas and actions.

To facilitate learning it is advisable to look for the correct meaning of the material we are reading or hearing. In other words, we must have the same "frame of reference" as the writer or the conversationalist.

You can learn words, ideas, and other material with meaning much easier and remember them much longer than those without meaning. Try this experiment. Look at the following list of words for 15 seconds and try to memorize them. Then cover them up and write them, not necessarily in order, on a piece of paper:

Horse	Barn
Grass	Cow
Oats	Pig
Wagon	Fence
Red	Post

No doubt you remembered all ten of the words. Why? Because they

have meaning to you. Not only does each word have a specific meaning, but they have interrelated meanings. They are all farm words. Now, try this. Look at the following list for 15 seconds and try to reproduce these from memory:

XSP	NDI
AHC	JSF
DZB	MCE
KQY	EOL
WCN	CFR

Wasn't that much more difficult? Material with little or no meaning or organization—such as lists of unrelated items (nonsense syllables, formulas, dates, names, etc.)—is less well remembered and more difficult to understand than material in which there is meaning and organization.

As in the story of the child and the apple, a word has meaning to you according to your past experience with the object which it stands for. However, many times we get the wrong meaning and later our memory fails us or we report the wrong facts.

Think back into your childhood and remember some of your experiences where you misinterpreted "adult" language.

One young boy went to church and heard them sing, "The Old Time Religion." On returning home he requested his parents to buy some pigeons—because the people at the church had said it was "The Only Time For Pigeons."

Another boy heard the phrase, "Gladly, The Cross I'd Bear." When asked what they had sung in Sunday School he replied, "Gladly, the cross-eyed bear."

These are not bizarre examples, but could be duplicated by merely asking your friends for such incidents in their past experience.

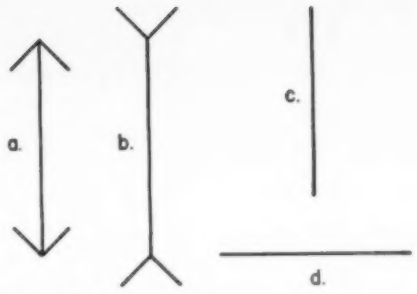


FIGURE 1—Sometimes we don't always see things as they really are.

3. Proper Mental Set. Another important factor in learning is your mental *set*. By this we mean where does your interest lie? What goals do you have in mind? Whatever your interest and concern at the moment, what you see or hear will be interpreted in relation to that pattern.

If you are not interested in what is being seen or heard there is small chance that it will "impress" you and the end result is no memory of what has happened.

To remember the material, you must consciously fit it into your pattern of thinking and doing.

4. Repeat the Material. Repeating some recently acquired material will enhance both understanding and remembering. As the story goes, a very successful Negro preacher explained his success by explaining that, "First I tells them what I'se goin' to tell them; then I tells them; and then I tells them what I done told them."

Mentally repeating a person's name or address, or an important message will help in committing it to memory.

5. "See" It Correctly. One good question to always ask yourself is, "Do I see it the way he does?" To learn correctly, and hence, to remember correctly, it is imperative that we "see" the subject as it is intended for us to see it. For, in remembering and relating facts, we "tells 'em the way we sees 'em."

For instance, look at the drawings in Figure 1.

As you may readily prove by using a ruler, the lines "a" and "b" are of equal length as are lines "c" and "d." However, lines "b" and "c" *seem* longer. The lines are equal, says a ruler, but we "see," and many times insist, that lines "a" and "d" are shorter. In learning then, we must try to understand the viewpoint of the person presenting the material. We must "see" it the way he "sees" it and wants us to learn it.

Take the drawings in Figure 2 for example. If you are unfamiliar with them you will nevertheless see each of them as resembling something you have seen in your past. What is more significant, you could see them a great number of times without seeing them any other way. The figure on the right might remind you of a telephone; the other a bird bath or vase.

Now look at them from another person's viewpoint and "see" then the way he may have intended for you to see them. If you look rather fixedly at each figure you will find two "faces" looking at each other in the "bird bath" and two "dogs" or "foxes" looking at each other in the "telephone."

Now try to look at the two figures without seeing the "faces" and "dogs." It's very difficult, and almost impossible because you have learned they are there. Later in remembering what you have seen you will recall that at first you were learning the "wrong" material and only after you got the other per-

FIGURE 2—In this illustration some will only "see" a vase or birdbath and an old fashioned telephone.

son's viewpoint did you learn correctly.

Examples of this sort are a great help in developing our understanding of the misunderstandings we have with others and the later "poor" memory.

6. Associate the Material. It makes very little difference in remembering whether the word is tisch, tavola, plateau or table so long as we respond by thinking of the object from which we eat. By the same token, it makes little difference what the stranger's name is if we associate it with him when we hear it. Tie the name in with his features, his dress or some other tangible object. Or try to associate it with something in your experience, for you will soon find that the wider and more diversified your previous experience, the easier it is to learn something new.

7. Overlearn the Material. If you want to be absolutely sure that you will remember a name, a formula or any other material, then you must "overlearn" it. Overlearning is achieved by studying the material beyond your ability to repeat it perfectly after a few moments of study. For instance, if you can learn a list of words for immediate recital after only six repetitions it may be necessary for you to repeat the list 25 or 30 times to insure remembering it permanently.

Some things that you have overlearned are:

- Your name
- Birthdate
- Place of birth
- Serial number
- Short poems
- Religious songs

As shown before by the farm words and the nonsense syllables, the number of repetitions for overlearning would depend upon the type of material you want to learn. Remember, though, overlearning does not mean learning more than is necessary; it does mean repeating many times what you have learned so that your retention will be permanent.

8. Distribute Your Efforts. Generally speaking, distributed learning is better than massed learning. However, there is no cut and dried formula for each person. If one person finds that 20-minute study periods separated by an interval of 10 minutes is best for him, it does not necessarily follow that it will be best for you. Nevertheless, studies show that some sort of distribution is better than none.

There are several reasons why distributed learning is superior to massed learning. First, if the study period is long and concentrated, fatigue sets in, thus interfering with the learning effort. Second, a short study period also motivates the learner. Third, the rest, or inactive period reduces fatigue and improves motivation. In addition, the rest period permits the individual to "mull over" what he has been studying and thereby enhances learning.

Other experiments point out perhaps even a more important factor. Rest periods tend to eliminate any errors of association or learning and thereby strengthen the correct ones.

9. Memorize What Should Be Memorized. There are many things that have to be memorized if they are to be retained at all. Such mechanical details as formulas, conjugations, lists of unrelated items, etc. Such material cannot be just learned by reasoning. Therefore, you'll save a great deal of reasoning time by committing such things to memory by rote memorization which will leave the mind free to concern itself with creative thinking and the larger ideas of the moment.

When memorizing, you must keep two factors in mind. First, do not attempt to memorize large quantities of material at one time. Ten to 15-minute intervals spent in memorizing are quite enough. Attention tends to wander after about 15 minutes and you would be wasting your time.

Second, memorize the material in the form in which you are going to use it. It is difficult to remember material in a sequence other than one in which it was memorized.

To illustrate this point try this experiment: look at the letter square below very closely and memorize it. Do not cover it or stop studying it until you memorize the letters.

K B S
P Y C
N X T

Now cover the letter square and start remembering the letters from the *lower right-hand corner.* Is it difficult? Yes, because we generally learn material from the upper left-hand corner and line by line.

The processes involved in learning just discussed here are usually considered "laws" of learning. While they are not actually scientific laws that can be depicted in equations, they do clarify the conditions under which learning occurs.

In considering these generalizations or laws, we have, of course, put the emphasis on "acquiring" material. In the next part of this article we will consider the process of "retaining" what you have acquired.

In Part 2, "The Two Processes of 'Memory'" which will appear in a coming issue, Mr. Quinton will discuss such highly interesting and informative points as:

1. **How well do you recall?**
2. **What is your memory span?**
3. **Why do we forget?**
4. **How fast do we forget?**
5. **The influence of emotions on remembering.**

About the Author

John D. Quinton is a training representative for Tennessee Gas Transmission Co., Houston, where he develops and presents training programs. Holder of a B.A. degree from Lincoln Memorial University and a M.A. degree from Tulsa University, he also completed two years' work toward a Ph.D. degree at Kansas University. All of Quinton's studies have been in industrial and clinical psychology. He has been a professor at Kansas and Tulsa universities, and has headed the Psychology Department at Arkansas Polytechnic College. Quinton was a consultant for Service Pipe Line Co., Tulsa, for two years, and a training representative for Shell Pipe Line Corp., for four years, before joining Tennessee Gas.

Pipe Line Pete's

IDEAS FOR THE FUTURE!

. . . in pipe line engineering, construction and operations

By Donald M. Taylor, Engineering Editor

Wave Guides in the Atmosphere

Air Force Cambridge Research Center made a joint announcement with the U.S. Navy that there was a sort of radio pipe line about 5,000 feet above the South

Atlantic. It can carry TV and radio signals with very little loss between South America and Africa. But this radio "duct" is by no means the only one. There's one between California and Hawaii, for example.

Now here's where I may be ripping my pants so-to-speak, with the many communications men who read this feature: I think there are many, many ducts that range about the continent. I remember, for instance, times when automobile radios in Canada were stronger than TGT's radio station at Monroe, La. Occasionally, pipeliners at the station had to ask drillers in their automobiles in Canada to relay messages to company automobiles a mere 15 miles or so away. Sometimes, the company radio would pick up firefighters in Oregon and on one occasion it picked up another gas company.

One night out of the blue came the query, "What's your suction pressure?"

The operator on duty thumbed the mike and replied, "Oh, it's about 467 right now."

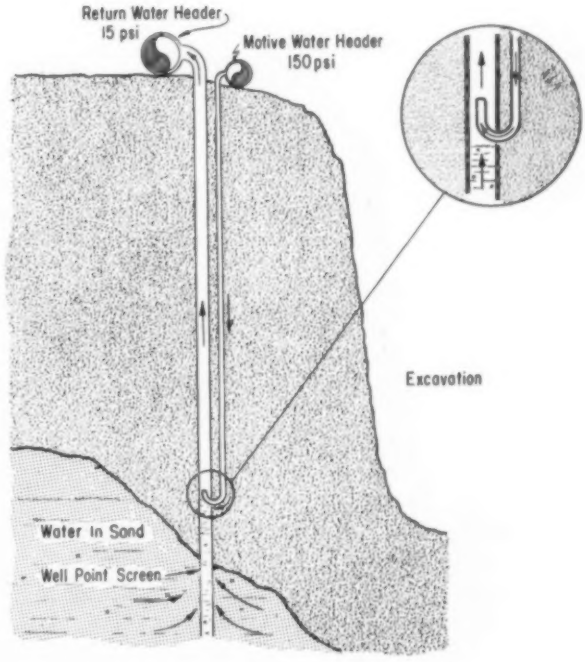
"Yipes!" came the excited reply. "You know we're never supposed to let that line go over 250! You'd better open that blowdown valve and run!"

It turned out that there was a mix up of gas companies; the one with the low suction was on the West Coast. And I'm not sure but what this was evidence of one of the ducts.

High-Pressure Water Jets Work Where Well Points Fail

Well points have proved successful on any number of pipe line jobs where excavations had to be dewatered. But it is a recognized fact that they must be staged where excavations are deep. The reason? A vacuum will lift water only 30 feet or so.

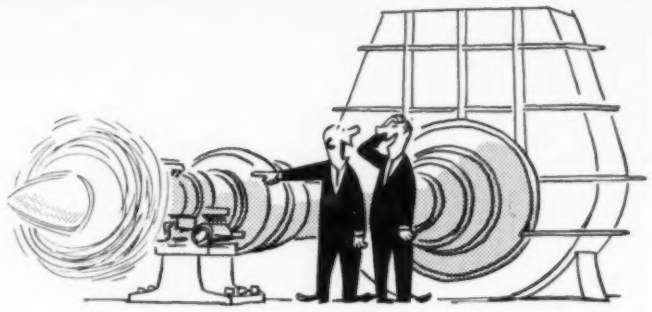
But high pressure jets just above the well point screen will lift the water considerably higher; moreover, the system is not damaged when the points suck air. Griffin Wellpoint Corp., of New York, recently designed a dewatering system along these lines for a New York subway contractor. Motive power for the jet eductors placed above each of 650 well points came from high volume water pumps. Their output was 4,500 gpm of 150 psi water. Return water had a pressure of about 15 psi and the system was designed to handle a total of 6,500 gpm.



Gas-Lubricated Bearings Permit Speeds to 350,000 rpm

The office of Naval Research in cooperation with nine other government agencies sponsored a recent symposium on gas lubricated bearings. The possibilities of this bearing are downright exciting. By using gas, rather than some other liquid for lubrication, a turbocompressor unit has been operated experimentally at 165,000 rpm, and another turbine made a short run at 350,000 rpm.

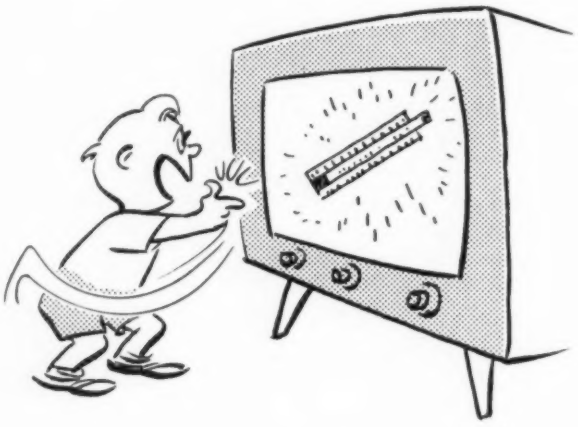
Advantages of gas are obvious—primarily it reduces friction. The trouble so far has been that it is difficult to keep the shaft suspended by air. The method that seemingly offers the most promise at this time is a hydrostatic bearing that keeps the shaft centered by directing gas flow through orifices around the circumference of the bearing. When the shaft is not centered, there's a pressure build up that forces it back to center.



There are many bugs, but scientists are taking the gas lubricated bearing very seriously at this time.

Guns, Horses, and Now New TV Courses

At my house, we divided all TV programs into two categories—"GUNS" and "HORSES."* This simplifies things. When I hear, "But Daddy! We've already had two 'GUNS' tonight and only one 'HORSE'," I know the next program will be a western to round out the pattern.



These simple appellations go hand in hand with the simple plots, which are identical except for means of transportation, the length and duration of the *fight* near the end; and of course, the detectives use automatics instead of revolvers.

But if we can believe what we read, TV is going to CHANGE!

NBC has announced that it is going to expand its *Continental Classroom* to 15 college level courses! What's more, in the North Central states, airborne TV will telecast 72 courses from a flying aircraft to Midwestern schools and colleges.

Next, we'll be having three classifications for the TV—"GUNS," "HORSES" and "SLIDE RULES!"

*We ignore commercials. They're for going to the bathroom. So far as the "GUESS AND GIVE" programs, they always conflict with the "GUNS" and "HORSES" so we've been spared the shock of learning that TV wasn't really real.

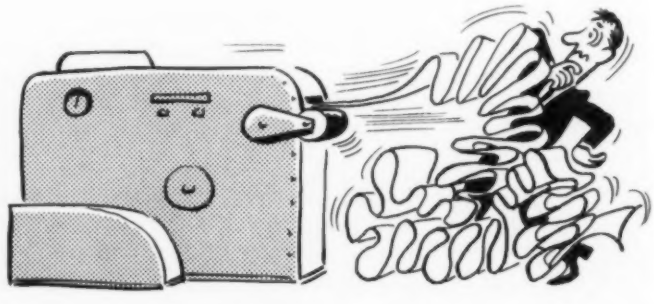
Prints Answers at Rate of 20,000 Characters Per Second

One of the hold-ups in our high speed computers has been the slowness of the machines that print our answers. Stanford Research Institute has developed a printer that can turn out printed copy at the rate of 20,000 characters per second!

Just how fast is this? Well, it would turn out a novel the size of *Peyton Place* or *Gone With The Wind* in about one minute! This is about 15 times as fast as the fastest computers now in service.

Heart of the unit is a monoscope that scans a photoengraved target with 64 letters and numbers on it in a television type technique. This scanning and subsequent printing is actuated by six wires from the computer.

One of the surprising features of the new development —it is quite inexpensive!



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Engineering Design

—74— How to Predict Subsurface Temperature Ranges

Ground temperatures are vital to pipe line design, for two reasons. First, the heat exchange between the contents of the line and the ground are greatly affected by the differential temperatures of the pipe and the soil. Second, the temperature of the pipe at time of installation will have a considerable effect on stresses, particularly where the subsequent ground temperatures will vary considerably from the installation temperatures.

For example, in the recent construction of a 34-inch line that is to operate at temperatures well over 100° F, care was exercised to limit bends when it was installed at temperatures ranging from 50 to 70° F and the underground temperature will range from about 50 to 80° F over a year's time.

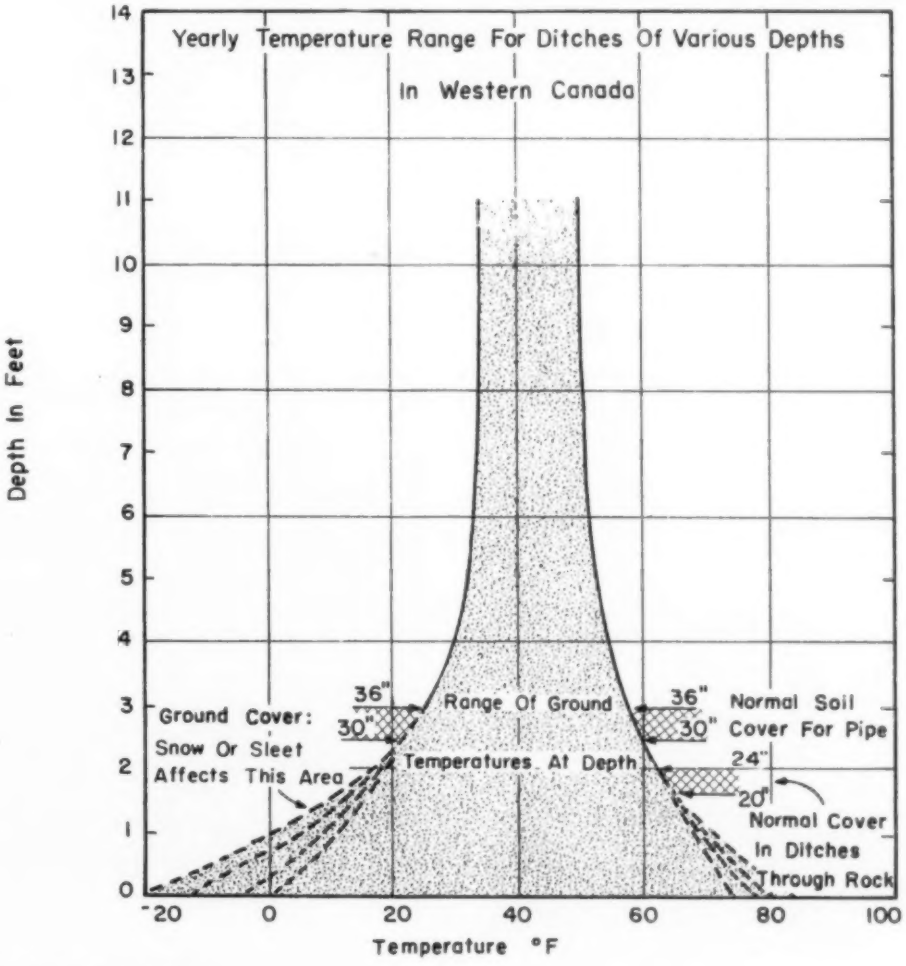
The accompanying curve and table shows the range of underground temperatures you can expect in the prairie regions of Canada, according to a Canadian engineer. At shallow depths, there is some variation and uncertainty as to temperature because of snow or sleet covering. But from three feet down, the temperature stabilizes.

Generally speaking, most areas will have somewhat similar curves from three feet on down. Of course, with depth, they approach the temperature of underground water, and the summer-winter variation ceases.

To adapt for U.S. work. As a comparison the following temperature ranges are encountered in summer and winter at depths of three feet in various areas in the United States.

California	51 F to 81 F
Colorado plains	35 F to 65 F
Texas (Panhandle)	42 F to 75 F
Texas (Coast)	60 F to 80 F
Mississippi	57 F to 80 F
Idaho	37 F to 56 F
Illinois	41 F to 56 F
Montana	33 F to 54 F
Michigan	38 F to 60 F
Wyoming	26 F to 65 F

Generally, a curve plotted for any one of the above will closely parallel the curve for Canada.



How to do it

PIPE LINE HINTS

$10 is paid for each illustrated acceptable contribution. Mail to The Editor, PIPE LINE INDUSTRY, P. O. Box 2608, Houston 1, Texas

Support Mixer From Tank To Eliminate Flange Stress

Supporting the mixer equipment from the lower ring of the tank instead of on a separate support adjacent to the foundation enables the mixer to move with tank expansion or settlement without stressing the flange at tank line or putting a bind on the shaft where it passes through the stuffing box.

By mounting the motor vertically over the propeller shaft one pipe line cuts down on the lever arm exerted by the weight of the equipment; this reduces the load carried by the flange and supporting ears on the tank wall too.

Placing a cross-bar beneath the end of the propeller shaft housing, and carrying the weight through this and a pair of tie rods—turnbuckle-equipped to permit adjustment—makes the pull on the rods more nearly vertical than would be possible were the rods carried only to the corners of the motor bracket. This method also reduces vibration transmitted to the tank ears—the long rods serve as dampeners.

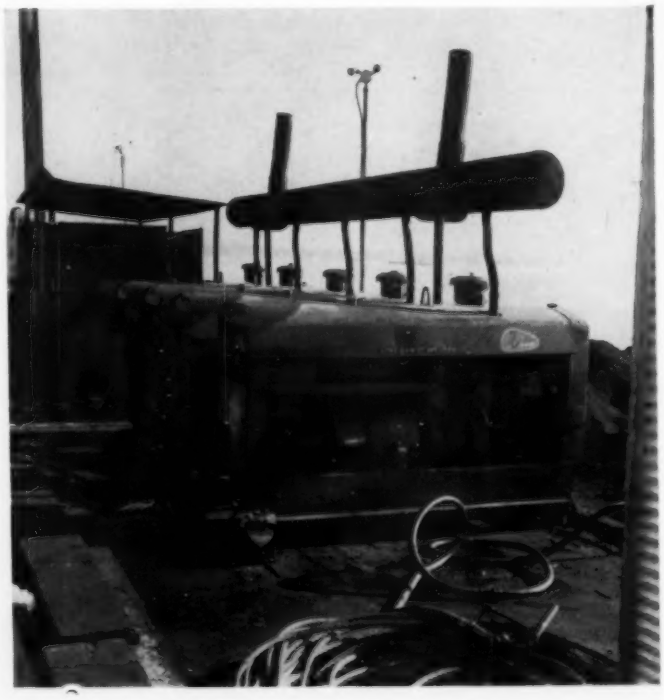
Manifold Reduces Engine Noise on Generator Units

Here is the way a battery of five diesel-powered welding generator sets had exhausts tied into a common manifold; the separate pulsations tended to neutralize each other, with resultant exhaust noise markedly less than when the five engines exhausted singly to atmosphere.

The manifold consists of a joint of 10-inch pipe, long enough to span the five units, and with dished ends welded in. By spacing the inlets to the manifold along the base of this horizontal pipe, using flexible metallic hose for the inlets, the exhaust gases are expanded into the large pipe. They then find their way to the two outlets of 4-inch pipe with collars welded to the manifold at unequal distances from the dished ends. Stacks are of 4-inch pipe, screwed into the collars, and thus removable when it is desired to shift the units.

The manifold is carried on two U-shaped brackets, carried on steel supports bolted to the flooring between welding units.

To prevent condensation entering the engine exhausts on starting up, the flexible hoses are allowed to project an inch or so within the drum. Water may collect while the unit is cold, evaporating later as during the day's operation.



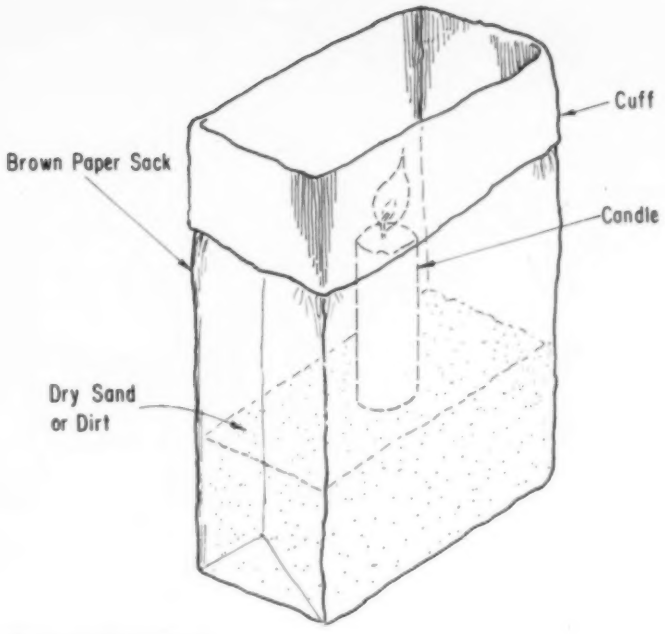
Fabricate Emergency Flare From Ordinary Paper Sacks

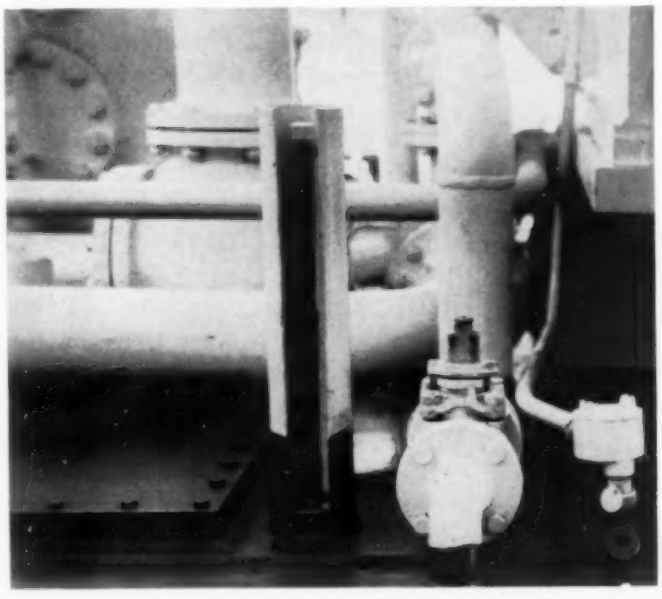
From an ordinary paper sack, some dry dirt and a candle, you can make a flare which should burn 8 to 10 hours if the wind is not too severe.

Making the flare is simple. Open up the sack, roll back one turn to form a cuff at the top, pour about 3 inches of dry dirt or sand in the bottom, place a candle in it and light it. Use the largest diameter candle available; the long-life type used in church is best (but it need not be of beeswax).

It is surprising just how much wind and bad weather these "flares" will withstand. The paper sack transmits enough light to be visible for some distance.

A variation of this flare is to place some sand or dirt inside a half-gallon jar. Add enough sand to bring candle fairly near the top. Light and you have a spare flare.





Steel Pipe Makes Shield For Floor-Level Gage Glass

On a large gas compressor speed increaser the oil sump is contained in the base of the unit; the correct operating height of the oil column is a few inches above the station floor.

To protect this gage glass from being tripped over when checking the gear box, or being damaged by mop or waxer when maintaining the station floor, a shield was made of standard pipe. The pipe shield is tall enough to top the gage, of a diameter large enough to fit snugly over the boss in the gear and a portion of one side is cut out.

Tack welded to the gear box, this shield is large enough to permit a socket wrench to reach the nuts holding the gage flange in place, yet fits closely enough around the gage so that striking the unit is prevented.

By painting the inside surface of the shield white, the oil level is readily determined by sighting through the slot.

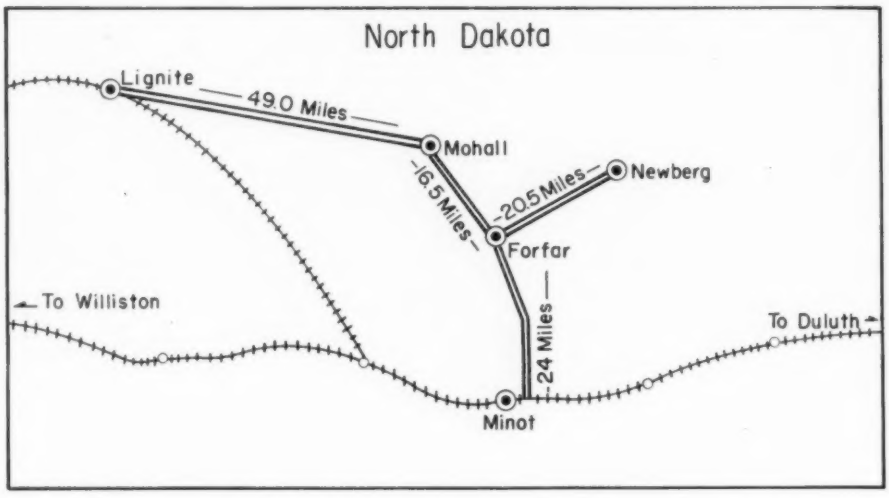
Roll Map on Window Shade And Mount It In Car Trunk

One of the problems of a field foreman, gager or pumper is to juggle field maps, and this can be a problem. Just let the average man, unfold a map, then quickly try to re-fold it, and he has more map than he started with. Besides, folding is hard on maps.

A solution to this problem is to roll the maps on window shades—the kind you buy at the hardware store—mount the window shade under the top of your car trunk lid, and you will have the ideal method of transporting maps about the field. The brackets that hold the window shade are simply screw-mounted in the underside of the trunk lid.

WHAT'S HAPPENING IN PIPE LINE CONSTRUCTION

By Donald G. DePugh, Construction Editor



Route of Great Northern's main railway system in North Dakota and its proposed crude line.

Great Northern Railway Plans to Lay 110-Mile Crude System in North Dakota

Great Northern Railway has filed an application with the Public Service Commission of North Dakota for authority to build a 110-mile crude pipe line.

The line, which has been under study by Great Northern since 1956, will transport crude from the Lignite and Newburg fields in Burke and Bottineau counties to the company's main rail line in North Dakota. The proposed $3½-million project would terminate in the Minot vicinity for loading crude into tank cars and shipping by rail to markets in St. Paul-Minneapolis and Duluth-Superior areas.

The railway company hopes to begin construction this year; size of the line is contingent on developments occurring between now and start of construction.

This is the first phase of a planned installation extending to the Twin Cities and Duluth-Superior markets.

The line will consist of a 49-mile segment between Lignite and Mohall; from Mohall, the line would extend south 16 miles to Forfar. At Forfar, the line forks 20 miles northeast to Newburg and 24 miles south to Minot. Approximately 30 miles of the system would be installed on the Great Northern right-of-way.

Joint Venture Planned For South Texas Gathering Lines

A joint application has been filed with the Federal Power Commission by Gulf Resources, Inc., and Natural Gas Gathering Co., Inc., for approval to supply South Texas gas to Tennessee Gas Transmission Company.

The joint venture includes plans for construction of 31 miles of 10, 12, and 14-inch gathering lines in Starr and Zapata counties. Natural Gas Gathering Co., Inc., a subsidiary of Delhi-Taylor Oil Corp., would operate the facilities. Gas will be purchased from Jonnell Gas Co., Atlantic Refining Co., Gulf Oil Corp., and independent producers. Tennessee will receive gas at its facilities near Zim field, Starr County. Gathering system will have a capacity of 70 MMcf daily.

Marathon Pipe Line Co. Completes Crude System

Marathon Pipe Line Company put into operation its Mosherville to Samaria, Mich., crude oil system early in March. The Ohio Oil Company subsidiary constructed the 57-mile line to take oil from the Scipio-Albion-Pulaski fields in Southern Michigan.

The 8-inch line connects with Buckeye Pipe Line Company line at Samaria. Gathering lines include a 3-mile, 6-inch line from Mosherville to Scipio field and a 15-mile, 6-8-inch line extending north from Mosherville. O. R. Burden Construction Corp., was the contractor.

Humble Awards Contract On 34-Mile Products Line

Sharman, Allen, Gay & Taylor, Inc. has been awarded a contract by Humble Oil & Refining Company to lay a 34-mile products pipe line.

The line will run from Baytown to Texas City, Texas.

Interstate Oil Pipe Line Constructs Gathering Lines

Construction is underway on Interstate Oil Pipe Line Company's 4-inch gathering system in Barataria Bay to serve the Saturday Island field on Plaquemine and Jefferson Parishes, Louisiana.

H. B. Hughes has contract for construction of the crude lines and two field pumping units, pumping platform and walkways for operation of the system.

The system will connect to the company's Lake Washington trunk line at a point near Manila Junction.

Equitable Gas Lets Contract on Gas Lines

Contract has been awarded to Joyce Pipeline Co. for construction of about 3 miles of 20-inch and 17 miles of 16-inch gas lines in West Virginia and Pennsylvania for Equitable Gas Company.

The 20-inch section will be laid in Greene County, Pennsylvania, and the 16-inch line is planned in West Virginia.

Ohio Oil Co. Awards Contract to Somerville

Somerville Construction Co. will lay a 28-mile gas gathering system in Michigan for The Ohio Oil Company. The system is near Jonesville, Mich.

Federal Power Commission Pipe Line Map Available

The Federal Power Commission has announced that the "Major Natural Gas Pipelines" map is available. The map is revised December 31, 1959, edition. Printed in three colors, it is 13 x 18 inches in size with a scale of 170 miles per inch.

Copies may be purchased from the Federal Power Commission, Washington 25, D.C., at 25 cents per copy.

Scurlock Oil Co. Plans 35-Mile Gathering System

Plans for construction of about 35 miles of gathering lines have been announced by Scurlock Oil Co. The lines will be laid in North Texas to take oil from three producing areas.

Two lines will be 4-inch diameter to gather oil in Harrison County fields.

Kansas-Nebraska Plan 90-Mile Gathering Lines

Kansas-Nebraska Natural Gas Company plans to construct about 90 miles of gathering facilities in Hugoton field and near Kimball, Neb. Completion is expected by September.

Shamrock Awards Contract On 130 Miles of Gas Lines

Contract has been awarded to Vaughn & Taylor Construction Co. for construction of 130 miles of gas lines for Shamrock Oil & Gas Co. Work includes a 49-mile, 20 inch section from Dumas to Amarillo, Texas, and 80 miles of 2-20-inch from Ochiltree County, Texas, to its Stewart compressor station.

Transwestern Pipeline Moves Through Mountains

H. C. Price Co. sets brisk pace through mountains in Arizona on the Transwestern Pipeline Company's 30-inch main line. Price has two spreads working from Flagstaff and Seligman, Ariz. The Texas to California gas line is scheduled for completion before June.

O. R. Burden, H. B. Zachry Awarded Joint Contract by Old Ocean Fuel Co.

Construction is scheduled to start on Old Ocean Fuel Company's 370-mile, 16-24-inch intrastate gas pipe line from Old Ocean field to Fort Worth, Texas.

O. R. Burden Construction Corporation and H. B. Zachary Co. have a joint venture contract on the $25 million project. Old Ocean is a subsidiary of Texas Electric Service Company of Fort Worth. It was formed to build and operate the system.

The main line includes a 22-24-inch section from Old Ocean field, which is located in Matagorda and Brazoria counties, to Fort Worth. The 16-inch segment will be an extension from Fort Worth to Graham, Texas.

Texas Electric has entered into a 20-year agreement with producers in Old Ocean field to take 250 MMcf of gas per day starting in December. The gas will be used as boiler fuel in the company's generating plants in Fort Worth and Graham.

Texas Pipe Line Company Proposes 42-Mile LPG Line

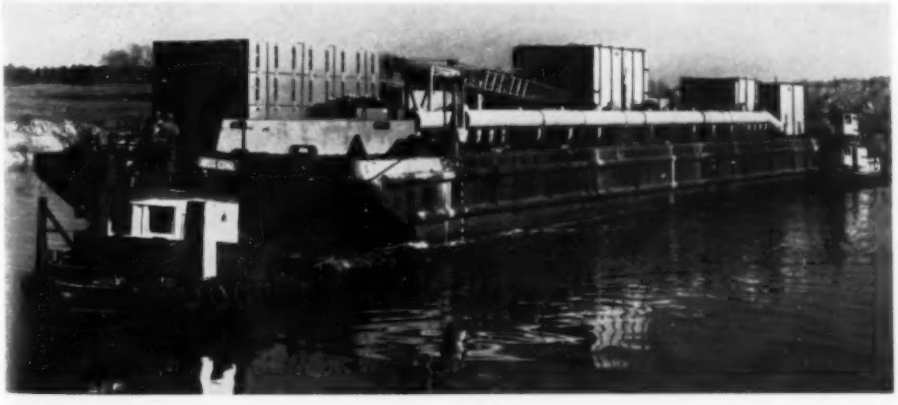
Texas Pipe Line Company will lay a 42-mile, 6-inch LPG line in East Texas. Planned for June completion, the line will run from the New Hope gasoline plant to the company's Nettleton station.

Esso Petroleum Plans 70-Mile Ethylene Line

A 70-mile ethylene pipe line is planned by Esso Petroleum Co. from its Fawley refinery to the proposed Severnside Works in south Gloucestershire, England. The Severnside Works will be constructed by Imperial Chemical Industries. The $2 million project is planned for completion in 1961.

Producers Pipelines Lets Contract on Crude Lines

Producers Pipeline Ltd., has let contract to Banister Construction Co. for construction of about 18 miles of 3-4-inch crude gathering lines in Canada.



From Houston to Tierra del Fuego

Brown & Root, Inc. will lay a two-mile, submarine crude line for Tennessee Argentina, S.A. from Tierra del Fuego to the Argentina mainland. Tennessee is working with the Argentina government agency, YPF, developing the oil fields in Tierra del Fuego. Crude lines will carry oil to tanker terminal in Argentina. The barge was launched from Houston last month and will take 60 days to reach the island.

Petroleos Mexicanos Moves Ahead On Gas-Products Pipe Line Work

By Melvin A. Judah, Editor, PIPE LINE INDUSTRY

MEXICO'S GOVERNMENT owned oil industry is setting a brisk pace of activity this year, and likely will continue for the future. A ten day tour of Petroleos Mexicanos facilities at Reynosa, Mexico City, Salamanca, Veracruz, Ciudad Pemex, Poza Rica, and Tampico demonstrated this to editorial representatives of the leading "Norte Americano" oil mazagines.

Shove method used on 24-inch C. Pemex-Mexico City gas line.

Pemex pipe line work is keeping up with the other phases of the industry, too. As is the case north of the border, there is little crude oil line construction this year. But the activity on gas and products lines is keeping Mexican contractors busy. And some specialized U.S. pipe line contractors and engineering firms are working for Pemex in joint ventures.

The 490-mile, 24-inch Ciudad Pemex-Mexico City line represents the big share of Mexican construction this year although first work on it started almost two years ago. This new 300 mmcf capacity line is scheduled to begin deliveries of gas to Mexico City from the Jose Colomo field in Tabasco late this year. Pipe being used on the line is 24-inch, 0.344-inch wall, API-5LX, X-52 being supplied by Tubacero from Monterrey. Steel for this line as for much of Pemex pipe requirements is from the Altos Hornos de Mexico mill at Monclova, Coahuila. Some 110,000 tons of steel will be needed for this system by completion. Over 280 miles of line has now been laid.

Main line contractors on the C. Pemex-Mexico City line are: Constructora Y Urbanizadora, S. A.; Cia. Constructora De Ductos, S. A.; Constructora El Aguila, S. A. de C. V. and Fish Service Corporation is doing the inspection on main line construction. Collins Construction Co. and Cia. Constructora "INDE," S. A. have a joint venture on the major river crossings; H. C. Price Company joined with Fabricas Protexa, S. A. in a joint venture.

Protexa-Price S.A. to weight coat 48 miles of the 24-inch main line. Much of the construction is through marsh and swampy terrain; in addition to this mileage of concrete coated pipe contractors also used some 30,000 river weights. The "stove-pipe and shove" method was used to cross numerous small swampy areas. No flotation ditches or barge work was used on this work.

Manual labor predominant in ditching through mountains on 490-mile gas line.

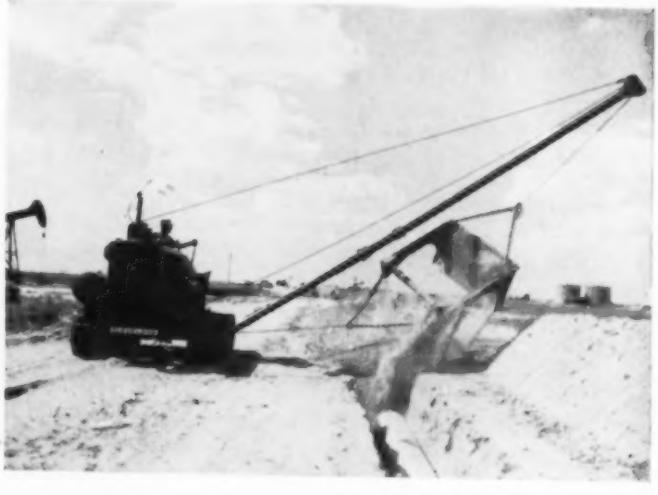
Daily capacity of the Pemex-Mexico City line will be increased to 430 million cubic feet by construction of two 6,000 horsepower stations; one at Minatitlan and another one 112 miles downstream are to be built within a year or two.

In Northern Mexico, the greatest pipe line construction activity is now being concentrated on completion of a 205-mile, 16-inch gas pipe line from Monterrey to Torreon. It is scheduled for completion this summer along with a 10-inch products line from Saltillo to Torreon, which parallels the gas line for most of the right-of-way. Work on these lines is being carried out in a joint venture by Fabricas Protexa, S.A. and Cia. Constructora "INDE," S.A. Rock, mountain, desert construction and river work were the toughest obstacles the contractors had to overcome on these lines. Some 12.5 miles of the products line was laid in the Santa Caterina River. Here the pipe line was buried 8 feet in the river bed. Both lines were coated with a coal tar-glass wrap system.

Principal products lines set to get underway in 1960 are the 12-inch line from Minatitlan to Puebla and Mexico City and a 293-mile, 8-inch line from Torreon to Chihuahua. Also, construction is scheduled to begin on a 12-inch gas transmission line from Torreon to Chihuahua.

Other projects Pemex has on the agenda for 1961 or later include a 4, 6, and 8-inch products line from Mexico City-Puebla to Cuernavaca, a products line from Guadalajara to Tepic and another products line between Aguascalientes to Zacatecas; a 6-inch products line from Guaymas to Ciudad Obregon and an 8-inch products line from Guaymas to Hermosillo are being considered. Several additional gas pipe line projects include an 8-inch line from Tierra Blanca to Veracruz and a 171-mile, 14-inch line from Mexico City to Salamanca, both scheduled to start construction this year. Another gas main line, from Carman to Ciudad Pemex, is planned.

Pemex's growing network of pipe lines will be expanded with additional crude lines in its southern region. An 8-inch oil line, scheduled to be built this year, will connect Comalcalco to Minatitlan. Another crude trunk line under consideration is the Minatitlan to Salina Cruz spur. This is contingent on a proposed Pemex refinery on the Pacific Coast.



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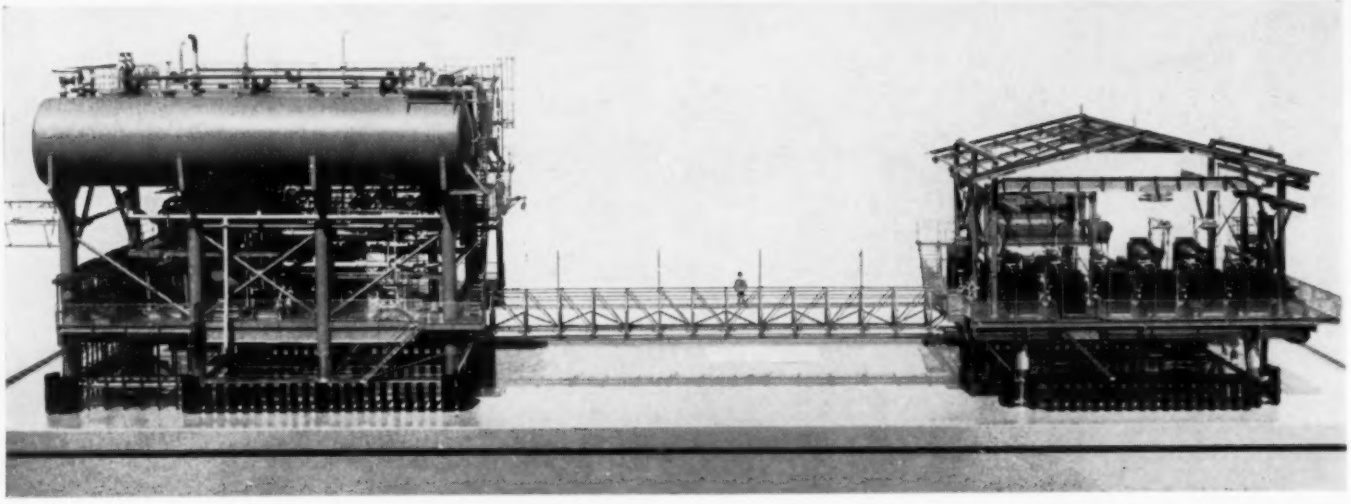


Scale Model Used in Designing Flow Station

To aid in designing and constructing its No. 2 flow station in Lake Maracaibo, Superior Oil Company of Venezuela had the above scale model built to 1/32 the actual size. Pipe Line Technologists, Inc., constructed the exact replica which includes all piping and pumping facilities of the offshore platform The station will consist of a separator platform, left, 58 x 70 feet and a pump station platform, right, 50 x 60 feet. Crude will be gathered from 24 wells and manifolded to gas-oil separators, and piped to the pumping units. The platforms are linked by a 100-foot truss type walkway which is also a pipe line support. Base of model represents the water line; units will rise 55 feet above water. Crude will be piped to tanker loading facilities and carried ashore.

Transcontinental Gas Forms Firm With Jefferson Lake Sulphur Co.

Transcontinental Gas Pipe Line Corporation and Jefferson Lake Sulphur Co. have formed a new chemical company, Trans-Jeff Chemical Corp.

Robert L. Topper of Transco is president of the company. Stock ownership will be equally shared by the two companies. Offices of the new firm will be in Houston.

Trans-Jeff will build a sulfur recovery plant near Tilden in McMullen County, Texas. Transco operates a gas treating plant to remove impurities from sour gas in Tilden. Trans-Jeff will recover sulfur from the waste acid gas stream. The company is studying feasibility to manufacture other chemical products.

Officers of the firm are Topper, president; Francis E. Lewis and Bradlee V. B. Postell, vice presidents; William H. Davidson, Jr., secretary; A. E. Bryan, treasurer, and A. D. Kirby, assistant secretary and assistant treasurer.

Directors include Eugene H. Walet, Jr., Robert L. Topper, Francis E. Lewis, James B. Henderson, J. F. Burtin, Harvey A. Wilson and Herbert M. Seydler.

Panhandle Eastern Awards Contract on Gathering Lines

Panhandle Eastern Pipeline Company has awarded contract to Hall Construction Co. on approximately 100 miles of gathering lines. The project calls for 26 miles, 12-inch; 12 miles, 10-inch; 10 miles, 8-inch; 24 miles, 6-inch, and 28 miles of 4-inch.

18-Mile Crude Line Underway in Nigeria

Shell-BP Petroleum Development Company of Nigeria Company will operate an 18-mile crude line under construction from Bomu field to an ocean terminal at Bonny, Nigeria.

The 12-inch line is being constructed by the African Construction Company and completion is scheduled for May. The final 10-mile section of the line will be under the Bonny River.

Construction was completed in December on a 14-mile, 12-inch crude line from Bomu to Afam connecting with the Afam-Port Harcourt line.

Seadrift Pipeline Corp. Plans 108-Mile Gas Line

Seadrift Pipeline Company, a subsidiary of Union Carbide Corporation, will lay a 108-mile 8-inch gas pipe line in Texas.

Pipe Line Technologists, Inc., has contract for engineering and construction supervision. The line will extend from Union's Seadrift, Texas, plant to Humble Oil & Refining Company's King Ranch gas plant at Ella, Texas.

140-Mile, 10-Inch Gas Line Planned in Colombia

Colombian Petroleum Co., affiliate of Mobil International and Texaco, and a Colombian firm, plans a 140-mile, 10-inch natural gas pipe line from Cicuco field to Barranquilla on the Caribbean. Designed for initial delivery of 20 MMcf daily, the $7 million project will be built and operated by Gasee Naturales de Colombia, S.A.

Mid-America Pipeline Co. Formed by Katy Subsidiary

Mid-America Pipeline Company has been formed by Southern Management Company, a subsidiary of Missouri-Kansas-Texas Railway Company.

The new company was established to complete financing on the Missouri-Kansas-Texas proposed LPG pipe line from West Texas-New Mexico to St. Paul, Minn., and Madison, Wisc.

Mid-America will headquarter in Tulsa. Williams Bros. Co. will make engineering studies on the line. Plans call for construction of the first section, to McPherson, Kans., by October.

PROPOSED PIPE LINE CONSTRUCTION

Here in convenient summary form is Pipe Line Industry's listing of company, line size, length, service, location and project status.

U. S.

Anchorage Gas Corp., Houston, 165 miles, 12-inch, gas, Kenai to Anchorage, Alaska, $15 million, planned.

Arkansas Industrial Pipeline Corp., Shreveport, 130 miles, 18-inch, gas, Perla-to-Helena, Ark., $9 million, planned.

Atlantic Seaboard Company, Charleston, W. Va., 43 miles, 20-inch, gas, main, Seneca to Terra Alta, W. Va., $25 million, before FPC.

Carolina Pipeline Co., gas, main line, from near Aiken to Pontiac, S. C., $5 million, approved.

Coastal States Gas Producing Co., Corpus Christi, Texas, 289 miles, 14 and 18-inch main line and gathering system, McAllen to Falfurrias, Tex., area, and Lopena to La Salle County, $12 million, contract let on 200 miles to O. R. Burden Construction Corp.

60 miles, small diameter, gas gathering line, to tie in with system under construction and extend to Pearsall County, Texas, planned.

25 miles, gas, Associated Gas & Oil Co. field to South-Tex Corp., processing plant west of Corpus Christi, Texas, planned.

37 miles, gas gathering in Brown, Eastland, Comanche and Erath counties, Texas, planned.

Coastal Transmission Corp., Houston, 81 miles, 3 to 10-inch, gas, laterals; 5,500 hp in stations at Port Lavaca, Texas, and Eunice, La., and additional 1,500 hp at Robstown, Texas, $6.2 million, before FPC.

Colorado Interstate Gas Co., Colorado Springs, 140 miles, gas, Green River, Wyo.-to-Provo, Utah; 109 miles, 26-inch, Texas Panhandle to southeastern Colorado; 136 miles, 34-inch, southeastern Colorado-to-Pueblo, Colo.; 107 miles, 30-inch, Pueblo-to-Denver, $91 million, before FPC.

Colorado Oil & Gas Corp., Denver, 400-miles, gas, from Gubik field to Fairbanks, Alaska, planned.

Columbia Gulf Transmission Co., Houston, 12.8 miles, 6 and 20-inch, gas, loop line in Louisiana, $730,000, authorized.

East Coast Pipeline Co., 90 miles, 12- to 24-inch, products, Linden, N. J. to Suffolk County, N. Y., $25 million, planned.

El Paso Natural Gas Company, El Paso, 244 miles, 30-inch, Permian-San Juan loops, 108 miles, 20-inch, field feeder lines, contract let on 120 miles to R. H. Fulton & Co.

69,240 hp in new and existing stations in Texas, Oklahoma, New Mexico and Utah, planned.

400 miles, 34-inch, Salt Lake City, Utah, to California border, before FPC.

120 miles, 10-20-inch, gas, Cowlitz, Wash. to Eugene, Ore., $10 million, contract let to Hood Construction Co. and River Construction Co.

Equitable Gas Company, Pittsburgh, Penn., 11.7 miles of storage pipe line and other facilities, $2,091,430, authorized.

12½-miles, 16-inch, paralleling existing system in Harrison and Marion counties, W. Va., authorized.

Farmers Union Central Exchange, St. Paul, Minn., 200 miles, 8-inch, products, Glendive, Mont. to Minot, N.D., planned.

Gillette Pipeline Co., Cheyenne, Wyo., 103 miles, crude, from Dead Horse Creek field to Casper, Wyo., planned.

Goliad Corp., Houston (Joint venture with **Union Oil Co. of Calif.**), 85 miles, LPG, Kaplan, La. to Baton Rouge, extraction plant at Kaplan and fractionation plant at Baton Rouge, $12 million, planned.

Great Northern Railway, 110 miles, crude, Lignite field to Minot, North Dakota $3½ million, before Public Service Commission of North Dakota.

Gulf Resources, New York, 125 miles, gas, gathering system, from Lopena area in Zapata County to a point in La Salle County, Texas, planned.

Hope Natural Gas Co., Clarksburg, W. Va., 45 miles, gas, from West Virginia to Pittsburgh area, planned, 20 miles, 24-inch, gas, in Wertzel and Monongalia counties, W. Va., authorized.

Houston Texas Gas & Oil Corp., St. Petersburg, Fla., 199 miles, 2 to 6-inch, gas, laterals; 20,000 hp in five new stations; $12 million, before FPC.

Humble Oil & Refining Co., Houston, 34 miles, 4-inch, products, Baytown to Texas City, Texas, contract let to Sherman, Allen, Gay & Taylor, Inc.

Iron Ranges Natural Gas Co., 115 miles, gas, from Itasca and St. Louis counties along route of Mesabi range from Grand Rapids to Aurora, Minn., $5 million, FPC authorization.

60 miles from Duluth to Silver Bay, Minn., FPC authorization.

Kansas-Nebraska Natural Gas Co., 15 miles, 12-inch, gas, loops and 4,800 additional hp at new and existing stations, $1.5 million, FPC authorization.

Michigan Wisconsin Pipe Line Co., Detroit, 311 miles, gas, main, Marshfield to Appleton, Wis., authorized.

66 miles, 30-inch, loops, Indiana, Illinois, and Michigan, authorized.

342 miles, 24-inch, gas, loops, Kansas, Missouri, Illinois, and Iowa, before FPC.

123 miles, 30-inch, loops, between Sandwich, Ill and Big Rapids, Mich., before FPC.

37 miles, 6 and 12-inch lateral loops in Wisconsin, before FPC.

29 miles, 30-inch, loops, Illinois, Indiana, and Michigan, 3,000 hp. station, Janesville, Wis., before FPC.

Two 2,000 hp units at Meade, Kansas; one 2,000 hp unit at Havensville, Kansas, before FPC.

Midwestern Gas Transmission Co., Houston.

504 miles, 24-inch, gas, from Minnesota-Canada border near Winnipeg to Marshfield, Wis., $52 million, FPC authorization.

Missouri-Kansas-Texas Railroad, 1400 miles 8-12 inch LPG line, Midland, Texas, area to St. Paul-Minneapolis, Minn., and Madison, Wis., $55 million, planned.

Montana-Dakota Utilities Company, Minneapolis, Minn., 15 miles, 6-inch, in Montana, gas 1,540 additional hp, $1 million, before FPC.

Natural Gas Gathering Co., Inc., (joint venture with Gulf Resources, Inc.) gas gathering facilities in Zapata and Starr counties Texas, before FPC.

Natural Gas Pipeline Company, Chicago. 151 miles, 36-inch, gas, loops, between Ford County, Kansas and Joliet, Ill. and 180 miles, 24-inch, main, from Minneola, Kansas to Kiowa County, Okla., $31 million, before FPC.

Northern Natural Gas Company, Omaha.

171 miles, main line extensions, 66 miles, main loops, 139 miles, branch lines, 6,000 hp additions, to extend system from Minneapolis to Duluth-Superior area, $25.7 million, contracts let on 315 miles to Williams Bros. Co. and R. H. Fulton & Co.

46 miles, main line extensions, 191 miles, loops, 1,767 miles, branch lines, and 45,400 additional hp, in Iowa, Minnesota, South Dakota, Nebraska, Wisconsin and Illinois, $76.7 million, FPC authorization.

37 miles, 30-inch, Bushton compressor station to Otis field, Kansas, 7,000 additional hp at Bushton, and development of underground storage facilities at Otis field, $20 million, before FPC.

Ohio Fuel Gas Co., 59 miles, gas, 4-24-inch main lines, in Belmont, Carroll, Cuyahoga, Fairfield, Logan, Lorain, Marion, Muskingum, Stark and Wayne counties, Ohio, $5.1 million, planned.

Ohio Oil Company, 28 miles, gas gathering near Jonesville, Mich., contract let to Somerville Construction Co.

Pacific Gas & Electric Co., San Francisco, 296 miles, 36-inch, gas, from Malin, Ore., to Antioch, Calif., southern section of line from Canada to California, before California Public Utilities Commission.

10 miles, 20-inch, Pittsburg to Walnut Creek, Calif. planned.

2.7 miles, 16-inch, Marin County, Calif., planned.

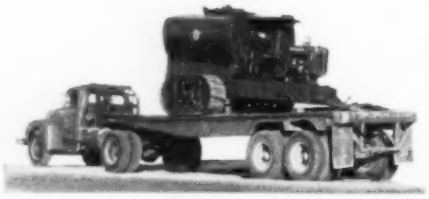
4.4 miles, 16-inch, Sonoma County, Calif. planned.

7.5 miles, 16-inch, south of Fresno, Calif. planned.

(Continued on Page 66)

DOPE
IS ALWAYS
HOT • READY and RIGHT from MYOCO ASPHALT KETTLES

Myoco asphalt kettles are designed to keep dope hot and always ready for instant use. Completely insulated, there is almost no temperature variation of filler between top and bottom. Coking, therefore, is unnecessary. Mechanically driven propeller and hydraulic bottom sweep prevent settling. Since the fuel tank is installed inside of frame, and protected from the firebox by the welded bulkhead, safety is assured. Available in 10, 27 and 30 barrel sizes, powered by a Wisconsin engine or its electric equivalent with Athey tracks, steel skids, or fitted for stationary use. Blower or mailbox burners are optional.



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PROPOSED CONSTRUCTION
continued

Pacific Gas Transmission Co., San Francisco, 614 miles, 36-inch, Kingsgate B.C. to Malin, Ore., northern section of Canada to California line, before FPC.

Peoples Gulf Coast Natural Gas Pipeline Co., Chicago, 16,000 additional hp in stations at Lufkin, Marshall, Texas; Texarkana, Searcy, and Biggers, Ark.; Jackson, Mo. and Hammond, Ill., contracts let to Trend Construction Co., H. B. Zachary Co., and Dravo Corp.

371 miles, 30-inch, loops, and 45 miles, gas laterals, 6,700 hp in Victoria County, Texas, $43.5 million, before FPC.

Permian Basin Pipeline Company, Omaha, 83 miles, 16-inch, gas, from Pioneer's proposed facilities to Spraberry, Texas, and 3,960 hp compressor station, $5 million, FPC examiner approval.

Pioneer Natural Gas Co., Amarillo, Texas, 62 miles, 10-inch main, Pampa, Texas, to Canyon, in Randall County, Texas, 20 miles, small diameter, gathering, 4,000 h.p. stations, $4.5 million, planned.

Phillips Petroleum Co., 25 miles, 6 to 20-inch, gas, South Eunice, New Mexico area, planned.

52 miles, 4 to 20-inch, gas, Gaines County, Texas, planned.

44-mile, 6-inch, products line, from Rocky pump stations to Amarillo, Texas, planned.

Rio Gas Gathering Co., San Antonio, 97 miles, 3 to 8-inch, gas gathering, South Texas, to supply gas to El Paso Natural Gas Company, planned.

Rocky Mountain Natural Gas Company, 65 miles, gas, southwestern Colorado to serve Delta, Orchard City and Montrose, Colo., planned.

Seadrift Pipeline Corporation, 108 miles, gas, main, from Union Carbide's plant at Seadrift to Humble Oil & Refining Company's King Ranch gas plant, planned.

Shamrock Oil & Gas Company, 49 miles, 20-inch, gas, Dumas to Amarillo, Texas, contract let to Vaughn & Taylor Construction Co.

Southern California and Southern Counties Gas Cos., Los Angeles, 200 miles, 34-inch, from Nevada-California border to point near Fullerton, Calif., $44 million, contract let on 115 miles to Young and Anderson Co., J. P. Neill, Hood Construction Co. and River Construction Co.

Standard Oil Company of California, 22 miles, 8-inch, crude, Kenai Peninsula to Nikiski, Alaska, $4 million, considered.

Tennessee Gas Pipeline Co., Houston, 21 miles, 16-inch, 2 miles, 12¾-inch, gas, Louisiana coast, Vermillion, Blocks 46 and 64, $2.9 million, before FPC.

158 miles, 36-inch, looping system in Louisiana and Mississippi, to supply Midwestern additional gas at Portland, Tenn., $61.4 million, authorized.

Texas Eastern Transmission Corp., Shreveport, La.

65 miles, gas, Delmont, Penn., to Lambertville, N. J., before FPC.

40 miles, Lambertvile to Linden, N. J., before FPC.

350 miles, 24-inch, coal slurry, West Virginia to New York, considered.

Texas Electric Service Company, Fort Worth, 300 miles, gas, Old Ocean field to Fort Worth, Texas, $25 million, contract let to O. R. Burden Construction Corp. and H. B. Zachry Co.

Transcontinental Gas Pipe Line Corporation, Houston, 129 miles, 30 and 36-inch loops; 53 miles of laterals, and additional horsepower capacity, in Texas Louisiana, Alabama, Georgia, North Carolina, Virginia, Pennsylvania and New Jersey, $53 million, FPC examiner approval.

211 miles, 36-inch, and 69 miles, 30-inch, loops and additional 32,040 hp in Texas, Louisiana, Mississippi, Alabama, Georgia and South Carolina, $52 million, before FPC.

13 miles, 24-inch and 18 miles, 20-inch loops, Louisiana, FPC authorization. 14 miles, 16-inch laterals, 1-mile, 12-inch lateral, Louisiana, $2.1 million, FPC authorization.

29 miles, 20-inch, gas, and 2,500 hp, in South Texas to take gas from South Texas Natural Gas Gathering Co., $2.4 million, before FPC.

Transwestern Pipeline Company, Houston, pipe line facilities to cost $5.4 million to make available additional gas reserves for the line presently under construction, before FPC.

Trunkline Gas Company, Houston, 252 miles, main loops, and 140 miles, laterals, between Longville, La. and Tuscola, Ill., $45 million, before FPC.

Underground Storage & Exploration, Upper Darby, Penn., 394 miles, 12-inch LPG, from Moundsville, W. Va. to Newark, N. J., $9 million, approved.

95 miles, 6-8 inch, laterals to Mauch Chunk, Penn., and to Philadelphia, planned.

Valley Gas Transmission, Inc., Houston, 55 miles, 3 to 8-inch, gas, gathering, in Hidalgo, Brooks, Starr and Jim Wells Counties, Texas, $15 million, before FPC.

International

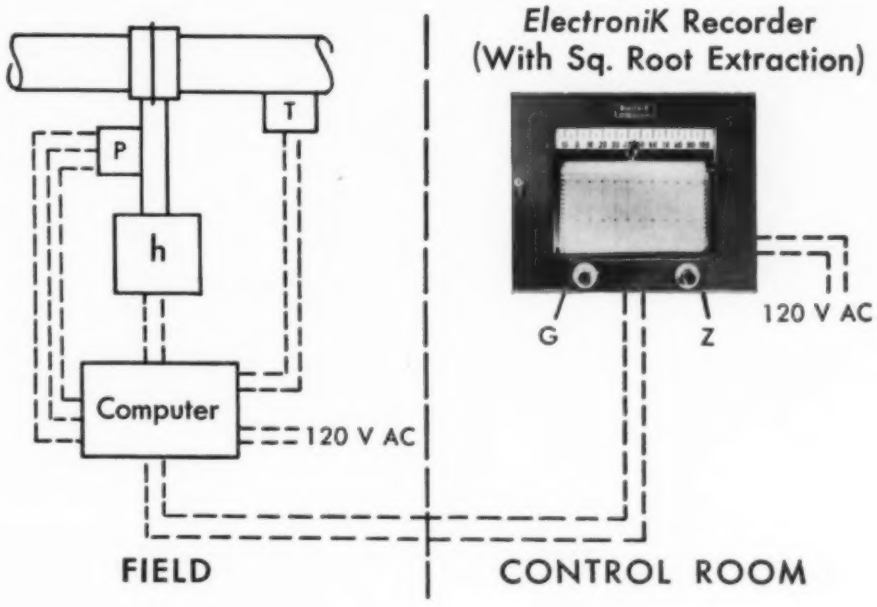
ACT Oils, Ltd., Montreal, 400 miles, crude, Dawson Creek, B. C., to Bella Coola, B. C., before B. C. government.

Alaska-Yukon Refiners and Distributors, Ltd., Edmonton, Alta., 150 miles, products, serving Alaska and Yukon territory, $3.5 million, planned.

Alberta Gas Trunk Line Company, 386 miles, 26-36-inch, gas, main, Berland River area, Alberta, to Alberta-British Columbia border; and 235 miles, 8-18-inch, gas, gathering, Alberta, $100 million, Alberta Oil and Gas Conservation Board, approved.

Alberta Natural Gas Company (Jointly owned by Westcoast Transmission Co. and Alberta & Southern Gas Co. Ltd.) 110 miles, 36-inch, gas, Alberta border to British Columbia-Idaho border, supply gas to Pacific Gas & Electric Co., $40 million, planned.

(Continued on Page 68)



New Honeywell all-electric Gas Flow Computer

measures and records mass flow rate automatically and continuously

Here's how the Honeywell gas flow computer solves a gas flow equation:

$$Q = K\sqrt{\frac{hP}{TGZ}}$$

Where **Q** = mass rate of flow, scfh
h = differential pressure, inches of water
P = static pressure, psia
T = flowing temperature, °R, (°F + 460)
G = specific gravity
Z = super-compressibility
K = orifice flow constant

The *ElectriK Tel-O-Set* △P/I transmitter measures *h*; an absolute pressure transducer measures *P*; and a resistance thermometer bulb measures *T*. The analog computer multiplies *h* by *P* and divides by *T* . . . and sends a resultant millivoltage to the *ElectroniK* recorder. The recorder applies the correction factors G and Z, extracts the square root, and records the resultant mass flow Q.

Easily linked to telemetering and remote control systems, supervisory control, data handling and industrial process computers.

No more tedious, time-consuming calculation of gas flow. This versatile gas flow computer does it for you . . . automatically, continuously. It measures and records gas flow in terms of standard cubic feet per unit time, and is the only all-electric system of its kind.

The Honeywell gas flow computer consists of an *ElectroniK* strip chart or circular chart recorder, a power supply, a standard resistance thermometer, an absolute pressure transducer, a voltage-divider type computing circuit, and an *ElectriK Tel-O-Set* differential pressure-to-current transmitter. The transmitters, transducers and computing circuitry can be mounted *near the orifice*, and only two wires bring the signal into the recorder in the control house. Field-mounted equipment available in explosion-proof housings.

There are many optional accessories. The recorder can be supplied with pneumatic or electric control, retransmitting slidewires, digital encoder, motor or servo-driven control index or pneumatic *Indexet*, hi-lo alarms, auxiliary contacts, pulse telemeter transmitter, and many other options.

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For more data on advertised products, use Readers' Service Cards, last page.

PROPOSED CONSTRUCTION

continued

Bituminous Oil Pipeline Co., Calgary, 250 miles, crude, from Athabasca tar sand plant in northeastern Alberta to Edmonton, approved.

Burmah Oil Co., Ltd., 850 miles, crude, 20 inch, from Nahorkatiya to Calcutta, India.

Cartier Gas Corp. (St. Maurice Gas, Inc., and Consumers Gas Co., Toronto), 170 miles, gas, Montreal to Quebec City, planned.

Consolidated Gathering Systems, Ltd., Calgary, 198 miles, crude, Sturgeon field to Edmonton, planned.

Creole Petroleum Co., 44 miles, 12-30-inch, gas, Bachaquero to Tia Juana, Venezuela, planned.

Development and Resources Corp., 70 miles, 8 inch, gas, from Agha Jari oil field to Ahwaz, Iran, planned.

Entre Nazionali Idrocarburi, Rome, Italy. crude, from Qum field in Iran to the Mediterranean Sea, considered.

Esso Standard Libya, 100 miles, 30-inch, crude, Zeltan oil field to Gulf of Sirte coast, planned.

Foothills Pipe Line, Ltd., 500 miles, 12 to 16-inch, LPG, from Alberta to Pacific Coast, $80 million, considered.

Gases Naturales de Colombia, S.A., 140-mile, 10-inch, gas, Cicuco Field to Barranquilla, Colombia, planned.

Hydrocarbons Pipeline, Ltd., Winnipeg. Manitoba, 880 miles, 6-8 inch, products, from Edmonton to Winnipeg, $35 million, partial authorization.

Independent Pipe Line Co., 2,019 miles, 34-36-inch, crude, Edmonton to Montreal, 23,000 pump horsepower, $395 million, before Borden Commission.

Interprovincial Pipe Line Company, 350-mile extension from Toronto to Montreal, looping line from Edmonton to Toronto, crude, $240 million, considered.

Additional horsepower in four new stations and several existing stations, $9.3 million, planned.

Island Transmission Company Limited, Nanaimo, B.C., 25 miles, 10-inch, gas, from point near Vancouver, B.C. to Vancouver Island, 67 miles, 10-inch, laterals to Victoria and Nanaimo, B.C., $14 million, appeal before British Columbia Public Utilities Commission.

Magna Pipeline Co., 25 miles, 4-inch, gas, Vancouver, B.C. to Vancouver island, $14 million, approved by Public Utilities Commission over Island Transmission Co. proposal.

Mid-Continent Pipe Lines, Ltd., 1500-mile, 30-inch crude, Edmonton to Chicago, planned.

National Iranian Oil Co., 146 miles, 6 inch, crude, from Azna to Isfahan, Iran. $5 million, planned.

1000 miles, 38 inch, crude, from central Iran to the Turkish Mediterranean coast, considered.

500 miles, 8-inch, products, Teheran to Meshed, Iran, contract let on 250 miles to Williams Bros. Co.

Peace River Oil Pipe Line Co., Ltd., 70-mile, crude, Swan Hills to Iosegun Junction, approved.

230 miles, 8-inch, crude gathering, from fields in northeast British Columbia to Dawson Creek, B. C., and

Grande Prairie, Alta., and to existing lines at Sturgeon Lake, $8.5 million, authorized.

Pembina Pipe Line, Ltd., Edmonton, 1,200 miles, LPG, from Alberta gas fields to eastern Canada, planned.

Petroleos Mexicanos, 4, 6 and 8-inch, products, Mexico City-Puebla to Cuernavaca, planned.

10-inch, products, Saltillo to Torreon, and 16-inch, gas, Monterrey to Torreon, contracts let to Fabricas Protexa, S.A. and Cia Constructora "Inde," S.A.

8-inch, products, and 12-inch, gas Torreon to Chihuahua, to be built in 1960.

12-inch, products, Minatitlan to Puebla and Mexico City, construction to start in 1960.

Products, Guadalajara to Tepic, planned.

Products, Aguascalientes to Zacatecas, planned.

6-inch, products, Guaymas to Cuidad Obregon, considered.

8-inch products, Guaymas to Hermosillo, considered.

8-inch, gas, Tierra Blanca to Veracruz, to be built in 1960.

14-inch, gas, Mexico City to Salamanca, construction to start in 1960.

(Continued on Page 70)

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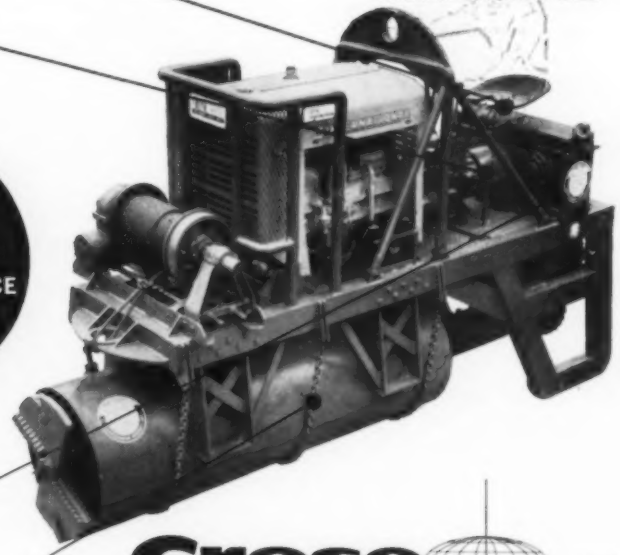

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The new Crose Road Boring Machine provides the fastest, simplest, most economical way for boring crossings and installing casings up to and including 42" in diameter. Heavy duty torque converter and reverse-o-matic transmission deliver full, constant speed and smooth power flow . . . let you switch auger from forward to reverse without engine slowdown . . . no gear shifting.

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PIPELINE PROTECTIVE COVERINGS THAT LAST

PROPOSED CONSTRUCTION

continued

Gas, Cuidad Carmen to Cuidad Pemex.

8-inch, crude Comalcalco to Minatitlan, to be built in 1960.

Crude, Minatitlan to Salina Cruz contingent on proposed refinery on Pacific Coast.

Pipelines of Puerto Rico, Inc., 95 miles, 8-inch, products, Penuelas to San Juan, Puerto Rico, approved.

Rangeland Pipe Line Company Limited, 111 miles, 8-inch, crude, southeastern Alberta to Calgary, $3 million, planned.

Shell-BP Petroleum Development Company, 18 miles, 12-inch, crude, Bomu Field to tanker terminal at Bonny, Nigeria, contract let to The African Construction Company.

Societa Nazionale Metanodotti, 650 miles, 18-inch, crude, Genoa, to Milan-Cremona-Torino, Italy, and Aigle, Switzerland, with extensions to Karlsruhe and Munich, Germany, planned.

Societe d'Etude du Pipe Line Sud-European, Paris, 419 miles, 30-inch, crude, port of Lavera to Strasbourg, with lateral extending 40 miles to Karlsruhe, Germany, approved by French cabinet.

Standard-Vacuum Oil Company, 60 miles, 8-inch, gas, main, in South Sumatra, considered.

Ste. d-Etudes de Pipeline Intercontinetaux, Paris, 1,400 miles, 30-40-inch, gas, from Hassi R'Mel field in central Algeria across Mediterranean, through Spain, France and into West Germany, considered, Fish International Corporation making engineering and feasibility studies.

Sui Gas Transmission Co., Multan, Punjab, India, 145 miles, 8-inch, gas, from Sylhet to Dacca, East Pakistan, $9 million, considered.

130 miles, 16-inch, gas, main line, Multan to Lyallpur, planned.

Trans-Canada Pipe Lines Limited, Toronto, 50-mile, 30-inch, gas, lateral, Winnipeg to Emerson, Manitoba; 74 miles, 34-inch, loops, additional compressor hp at Swift Current, and Indian Head, Saskatchewan, and Portage la Prairie, Manitoba, $45 million, planned.

268 miles, 34-inch, loops, and additional hp planned for 1961, $69 million.

122 miles, 34-inch, loops, hp additions, $46 million, planned for 1962.

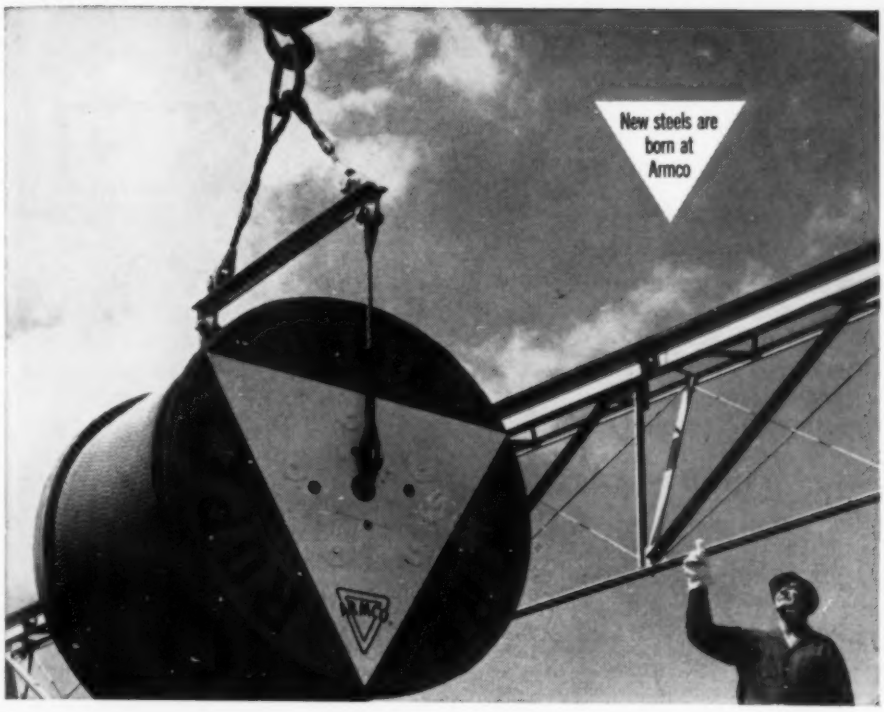
Trans-Prairie Pipelines, Ltd., Edmonton, crude line, from Weyburn field to Regina-Moose Jaw areas, $5 million, considered.

Westcoast Transmission Company, Ltd., 250 miles, 30-inch, gas, Taylor to Fort Nelson, B. C., planned.

Williams-McWilliams Industries, Inc., New York, 441 miles, 6-inch, crude, Villa Montes, Bolivia to Villa Hayes, Paraguay, considered.

Yacimientos Petroliferos Fiscales, Buenos Aires, Argentina, 621 miles, 12-inch, products, Mendoza to San Lorenzo, Argentina, $19 million, planned.

450 miles, 16-inch, crude, from Neuquen Province to Bahia Blanca, planned.



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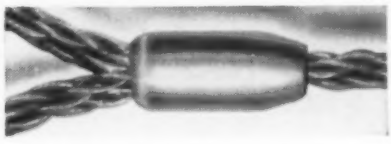
Exclusive 9-part machine-braided fabric gives flexibility never found in any other sling. It's next to impossible to kink. If a kink should occur, it can be smoothed out easily leaving no damage.



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4. When loading slings with more than two legs: load a 3-legged sling as though it had 2½ legs; load a 4-legged sling as though it had 3 legs.

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Service Pipe Line Plans Electric Unit at Artesia

Service Pipe Line Company plans to install an electric pumping unit of 200 horsepower at Artesia, N.M. The unit will be added to handle increased production from Empire Abo field in Eddy County. It will increase the gathering capacity to 11,000 barrels daily. Also, two miles of 4-inch pipe line will be laid.

PIESA-PESA Conference

The 32nd annual Petroleum Industry Electrical Association and Petroleum Electric Supply Association conference and exhibit will be held April 12-14 at the Muehlebach Hotel and Municipal Auditorium at Kansas City, Missouri.

Some of the topics for the technical program will include designs for the future in electric motors and power control; electronic controls of pipe lines; silicon diodes in pipe line rectifier applications; future energy sources; microwave system maintenance and remote control and metering system.

Metal Meeting

A large turnout is anticipated for the Second Southwestern Metal Exposition and Congress May 9-13 at the Sheraton-Dallas hotel in Dallas.

Eight one-half day technical sessions are scheduled for the four day meeting. Topics of interest to pipeliners include Failure Analysis—fatigue, fractures examination, die and tool failures.

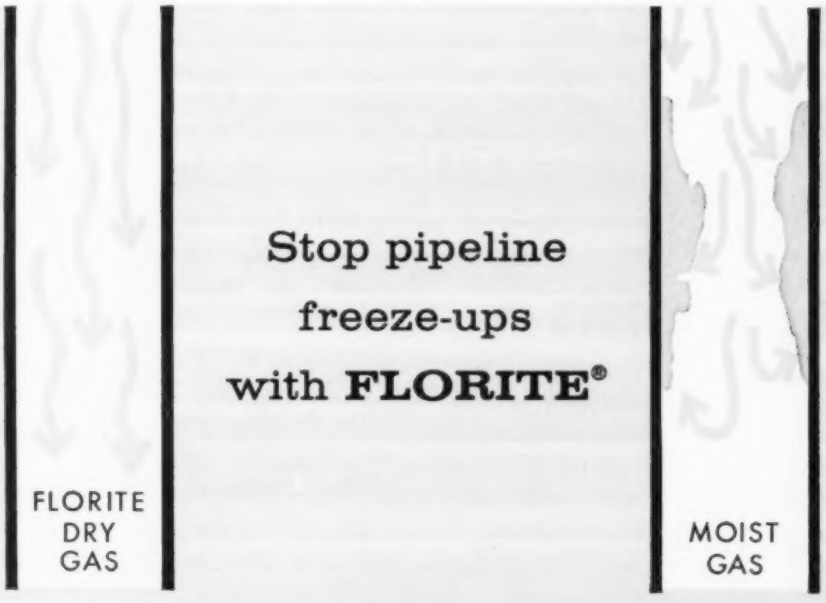
API Transportation Conference

A panel discussion on automation in the pipe line industry will highlight a two-day American Petroleum Institute Division of Transportation meeting in Tulsa at the Mayo Hotel, April 28-29.

Other topics at the annual Pipe Line Conference will include discussion on the future of pipelining, right-of-way problems, public relations, transient pressures in long pipe lines, automation and instrumentation, offshore installations and marine terminals, and dispatching and scheduling.

The panel discussion planned for the afternoon of April 28 will be divided into two sections. The first group of panelists will discuss the economic justification, management goals and industrial relations concepts of automation. The second panel will consist of technical people who will evaluate and appraise pipe line industry's accomplishments in the field of automation.

Reservations are being handled by J. P. Arwood of the Tulsa Chamber of Commerce.



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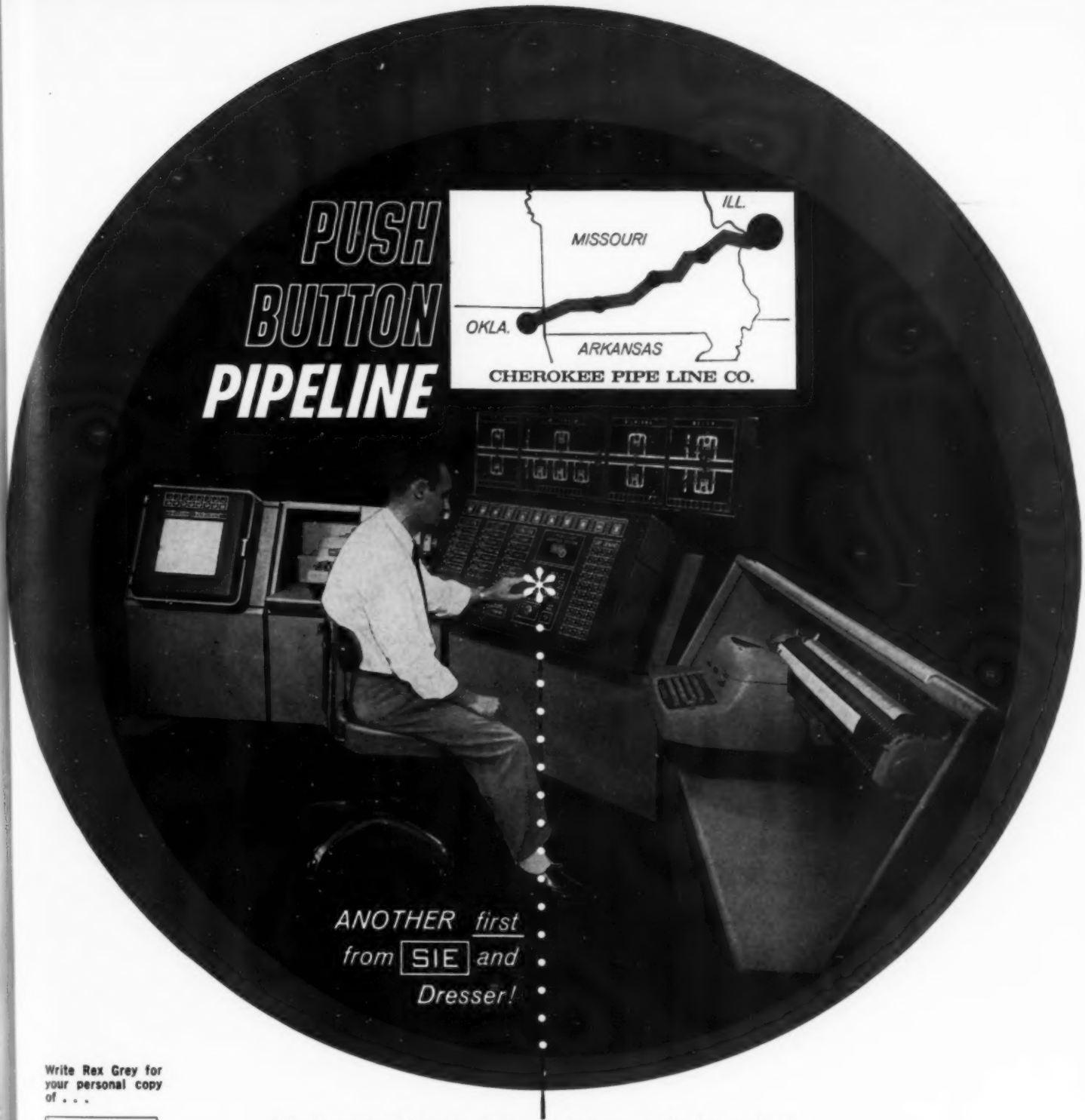

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SADDLES: Conventional, and for pressure vessel heads. Nozzle sizes from ¼" to 24". Fleet-Line saddles weld neatly into place in much less time, and with much less welding rod.

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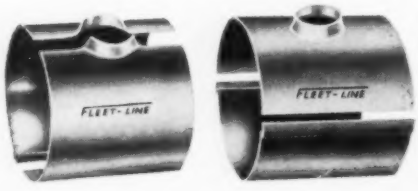

REDUCING TEES, Forged Steel Manifold Type.

Dealers and Stocking Distributors throughout the United States and Canada.

All orders acknowledged by air mail or long distance telephone and filled at once.

STEEL FORGINGS, Inc.

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What's Happening

among MEN in the INDUSTRY

French Contractors Visit in Tulsa

Representatives from French pipe line contractors visit with Crose-Perrault Equipment Corp. personnel in Tulsa. Left to right, Paul Simeon, managing director, Societe Parisienne pour l'Industrie Electrique; Paul Evans, Crose-Perrault sales engineer; J. L. Guyot, director general, Societe Entrepose; and John Manley, export sales manager of Crose-Perrault discuss foreign pipe line activities.

Magnolia Pipe Line Company announces the appointments of **R. L. Taylor** a director and vice president, and **E. J. Wacker, Jr.** a director. **L. E. Frensley** was elected treasurer and **James R. Ball** assistant secretary.

R. L. Taylor

Taylor had been executive assistant to **H. L. True,** president of the company. He has been with the company since 1923. Wacker joined the pipe line firm in 1939 and has worked in engineering, employe relations, purchasing, electrical and research activities. Frensley will continue to serve as comptroller. He joined Magnolia in 1935. Ball assumes his new duties in addition to his present assignment as manager, Right-of-Way and Claims department.

H. R. Rohwedder succeeds **W. T. Bulla** as director of operations for **Natural Gas Pipeline Company of America, Peoples Gulf Coast Natural Gas Pipeline Company** and affiliates. Bulla recently retired.

Rohwedder joined the company in 1930, and has served in a number of supervisory capacities including superintendent of compressor stations for Peoples Gulf Coast.

Shell Oil Company's West Coast Pipe Line Department manager, **M. C. Alcorn,** has retired after 33 years service with the company.

He began his career with Shell in 1926 as a draftsman in the Pacific Coast Exploration and Production Area in Los Angeles. He was named district superintendent of pipe lines in 1938; pipe line superintendent in 1944, and manager of the West Coast Pipe Line Department in 1946. He directed an economic study of a heated oil pipe line system for Shell in Venezuela. He is president of the Western Pipeliners Club.

J. W. Meehan, formerly president of Derby Refining Co., has been named president of the newly formed **Vickers Refining Co.,** a separate division of the **Vickers Petroleum Co., Inc.** Meehan also was elected to the board of directors and named a vice president of the Vickers Petroleum Co., Inc.

The new refining company will include what formerly was the manufacturing, transportation and marketing departments of the parent firm. Meehan joined Colorado Oil and Gas Co. in 1957, and was named president of its division, Derby Refining Co., in 1959. He served as president of Derby's affiliate, Jayhawk Pipeline Co. since 1957. For 25 years he had been associated with the Pure Oil Co. Before joining Derby he was general manager of crude oil purchasing and president of Pure Transportation Co. and Arapahoe Pipe Line Co.

Union Texas Natural Gasoline Corporation has elected officers of the company. **John T. Oxley** was named executive vice president; **Frank B. Markle, Wayne V. Jones, Daniel B. Lovejoy** and **R. C. Frederick** are senior vice presidents.

R. Vance Nugent has been named to the newly created position of purchasing agent for **Magnolia Pipe Line Company** with headquarters in Dallas. Formerly purchasing agent for **Mobil Oil Company's** Central Pipe Line Division, Nugent has been with the company since 1936.

Central supervision from Utah to California with BRISTOL TELEMETERING

More than 600 miles long, new Four Corners crude pipe line can be operated over its entire length from Los Angeles terminal.

Getting up to 80,000 barrels per day of crude from the prolific oil-producing Four Corners area (where the states of Colorado, Arizona, New Mexico and Utah meet) to the refining centers of Southern California is the job of the new Four Corners Pipe Line.

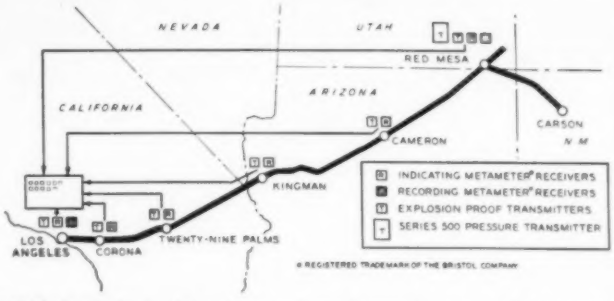
Providing the vital instrument readings necessary for efficient, economical, remote operation of this pipe line is the task of Bristol Metameter* telemetering, operating over privately-owned microwave radio links.

Four Corners Pipe Line is the first of such a length ever designed for operation from a single, central control station at its Los Angeles terminal.

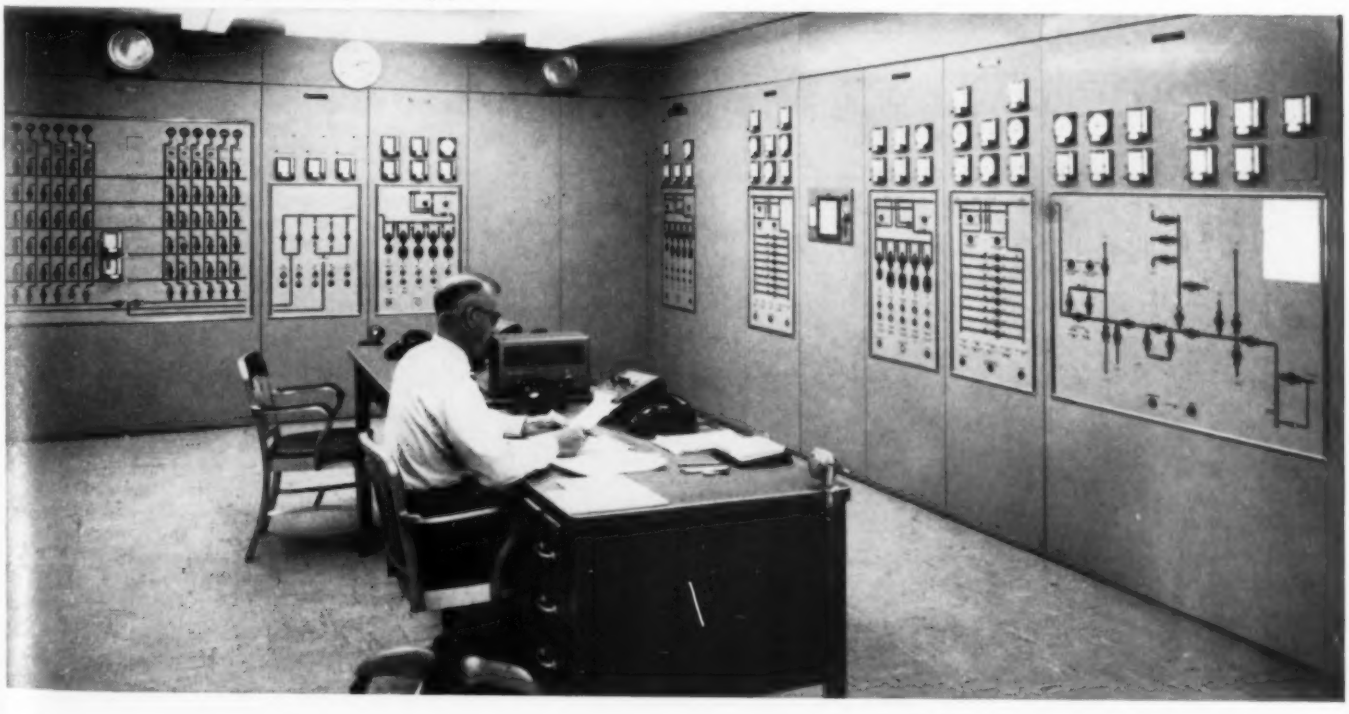
The telemetering system provides both for transmission of instrument readings to the central dispatcher's office and for local readings at pipe-line stations (see map).

This is just one of hundreds of Bristol telemetering systems in operation today for oil pipe lines, natural gas pipe lines (including corrected flow), electrical transmission networks, water plants, and industrial plants. Pressure, liquid level, flow, temperature, mechanical motion, voltage, current, power, are just a few of the variables that can be transmitted for distances varying from a few yards to hundreds of miles. Almost any transmission medium may be used: Telephone lines, carrier current, microwave, VHF or UHF radio. Find out what Bristol telemetering can do for your operation. Write the Bristol Company, 114 Bristol Road, Waterbury 20, Connecticut.

*T. M. Reg. U.S. Pat. Off. O-18



Miniature Bristol Telemetering Recording and Indicating Receivers, on panel shown below, give dispatcher instant instrument readings from points up to 600 miles distant along Four Corners Pipe Line. (See map.)



BRISTOL ...for improved production through measurement and control
AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

G. E. Judd, formerly assistant editor of Chain Store Age, has been appointed special feature writer on the **American Gas Association's** public information staff.

Prior to his association with Chain Store Age, he was public information specialist for the U.S. Navy and member of the editorial staff of Post Exchange Publishing Corp.

Ray Ward & Son, general contractor, has created a new maintenance division to handle commercial and industrial projects in West Texas and New Mexico. **Boyd Anderson** has been named general manager of the new division which will concentrate maintenance work in oil and gas industry, including pipe lines.

Fuller McCowan has been appointed to the public relations department in **Gulf Oil Corporation's** Houston office. McCowan replaces **Ralph Lewis** who has been transferred to Port Arthur, Texas, in charge of a newly established public relations office.

McCowan has been with Gulf for 6 years and had been in the Advertising Department prior to his recent appointment. He had been with Pittsburgh Steel Corp. as advertising manager before joining Gulf. Lewis has been with the company since 1950, and in 1955 he was moved to the Houston public relations staff.

R. W. Brandon

George W. Anders

Texas Gas Transmission Corporation announces the appointments of a new treasurer, financial director and director of public relations. **R. W. Brandon** was named treasurer, **George W. Anders** becomes the director of financial relations, and **John R. Blewer** was appointed public relations director.

John R. Blewer

Brandon has served as assistant treasurer for five years; he succeeds **V. W. Meythaler,** who was named financial vice president. He joined the company in 1950, and was named assistant treasurer in 1955. Anders has been with Texas Gas since 1956, when he was appointed director of public relations. He will direct activities of the company in its relations with financial institutions and security dealers. Blewer will be responsible for all public relations and advertising activities. He had been with Bozell & Jacobs, Inc., and previously was associated with Texas Eastern Transmission Corporation.

Henry H. Beeson has been named natural gas coordinator for **Mobil Oil Company** with headquarters in Dallas. He will coordinate company relationships with the Federal Power Commission and administer negotiations of all gas sales and gas purchase contracts.

Beeson joined the Mobil organization in 1946 as assistant manager of **Magnolia Petroleum Company's** Natural Gas Department. In 1959, he became natural gas manager for the Houston Exploration and Producing Division.

Albert Benjamin has been named director of public relations for **Texaco Inc.** He has been manager of the Latin American Division at Caracas, Venezuela. Benjamin succeeds **Thomas D. Durrance,** who has been appointed manager of public relations for Texaco's affiliate **Arabian American Oil Company.**

He had served as editor and corporate public relations specialist in publishing field prior to joining Texaco. He will be headquartered in New York.

John B. Hussey, 52, member of the Federal Power Commission, died March 17 at San Antonio at an American Petroleum Institute meeting. He was appearing at the southern district API meeting to deliver a speech. He collapsed and died just when he was introduced as a speaker at the meeting.

During the past year Hussey has suffered two mild heart attacks. A native of Jefferson, Texas, and a former attorney of Shreveport, La., Hussey was appointed by President Eisenhower as a commissioner on the FPC in 1958. Previously he had served on the Louisiana Conservation Commission.

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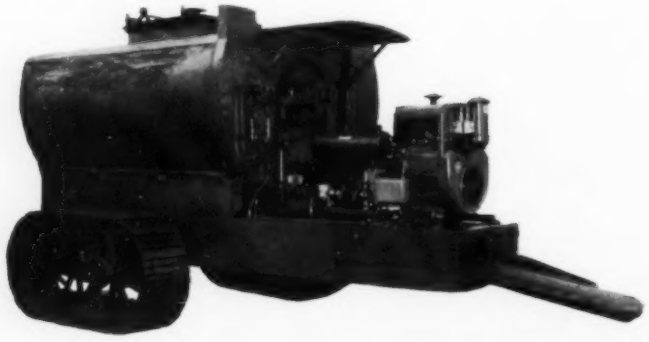
A new name to the pipeline, but with personnel having years of design and fabrication experience with Pigs and Pipeline Equipment. Ready to help you on your cleaning problems with our full line of cleaning, squeeging and batching pigs stocked in popular sizes to assure immediate shipments. Consult us for variations to catalog items to suit your individual cleaning problems.

Also distributors of Hercules-Pemco (formerly Perrault-American) Hot Dope Kettles.



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2525 MAGNET STREET, HOUSTON, TEXAS

Preparing site
and building a haul road

CAT NO. 955 TRAXCAVATOR VERSATILITY PAYS OFF AGAIN

The drill site is a dry lake bed near Rochester, Tex. But it's not as easy as it sounds. There's water beneath the surface and plenty of sinkholes to trap trucks and other equipment. To overcome these hazards, Tucker & Stephens of Graham, Texas, has the job of building a haul road and preparing the site for the rig.

T & S trucks haul fill from a stockpile at an old drill site nearby. A Caterpillar No. 955 Traxcavator loads 5-yard trucks in about two minutes. No time wasted.

Traxcavators are designed to be fast and flexible. Visibility is excellent so an operator can see the work. Bucket position indicators help him place the bucket for fast, efficient digging. Hydraulics respond rapidly. He commands a bucket with excellent pry-out action and carrying ability. It has a 40° tilt-back at ground level and a full range of positions to a 45° discharge angle. And he works in comfort, cushioned on foam rubber, in a compartment that's roomy, uncluttered and safe.

There's a Traxcavator in the size you need for your work. The No. 977 has a 2¼ cu. yd. bucket. The No. 955 has a 1½ cu. yd. bucket . . . while the bucket on the No. 933 has a 1⅛ cu. yd. capacity. Each Traxcavator has a wide variety of specialized buckets, including the exclusive side dump.

See what a Traxcavator can do on your job. Ask your Caterpillar Dealer to arrange a demonstration.

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HARD WORKING
LONG LASTING
LOADER VERSATILITY

WHO'S MEETING WHERE

April

Florida-Georgia Gas Association convention, Biltmore Hotel, Palm Beach, Fla., April 8-9.

Ninth Annual Instrumentation Short Course, Los Angeles Harbor Junior College, Wilmington, Calif., April 12-13.

PIEA-PESA, thirty-second annual petroleum industry conference and exhibition, Hotel Muehlebach and Municipal Auditorium, Kansas City, Mo., April 12-14.

Southwestern Gas Measurement Short Course, Drill Hall, North Campus, University of Oklahoma, April 19-21.

Indiana Gas Association, French Lick-Sheraton Hotel, French Lick, Ind., April 20-22.

Southern Gas Association, annual meeting, Galveston, Texas, April 25-27.

ASME Metals Engineering Division—AWS conference, Chase-Park Plaza, St. Louis, April 25-29.

American Welding Society, 41st annual meeting and exposition, Los Angeles, April 25-29.

NGAA, annual convention, Rice Hotel, Houston, April 27-29.

API, Division of Transportation, pipe line conference, Mayo Hotel, Tulsa, April 28-29.

May

LPGA, 29th annual meeting, Conrad Hilton Hotel, Chicago, May 1-4.

American Petroleum Institute, Division of Transportation, tanker conference, Seaview Country Club, Absecon, N. J., May 1-4.

American Institute of Mining, Metallurgical and Petroleum Engineers, annual joint meeting of Rocky Mountain Petroleum sections, Calgary, Alb., May 5-6.

Instrument Society of America, Summer Instrument-automation conference and exhibit, Civic Auditorium and Brooks Hall, San Francisco, May 9-12.

AGA Operating Section, joint distribution and transmission conference, Roosevelt and Jung Hotels, New Orleans, May 9-13.

American Society for Metals, southwestern metal congress and exposition, Dallas, May 9-13.

ASME, oil and gas power conference and exhibit, Muehlebach Hotel, Kansas City, Mo., May 22-26.

June

Appalachian Underground Corrosion Short Course, West Virginia University, Morgantown, W. Va., June 1-3.

September

NGAA, Rocky Mountain Regional Meeting, Palliser Hotel, Calgary, Alb., September 15.

ASME, petroleum division meeting, Jung Hotel, New Orleans, Sept. 18-21.

AIEE, electrical conference of petroleum industry, Hotel Skirvin, Oklahoma City, Sept. 25-28.

Instrument Society of America, 15th annual meeting, New York City, September 26-30.

October

NACE, 10th annual Western Region Conference, Sheraton-Palace Hotel, San Francisco, October 6-7.

NACE, Southeast Region Conference, Dinkler-Plaza Hotel, Atlanta, Ga., October 6-8.

NACE, Northeast Region Conference, Prichard Hotel, Huntington, W. Va., Oct. 11-14.

NACE, South Central Region Conference, Schroeder Hotel, Milwaukee, October 19-20.

NACE, South Central Region Conference, Mayo Hotel, Tulsa, October 25-28.

NGAA, Southern Regional Meeting, Carlton Hotel, Tyler, Texas, October 28.

This is one of the Deep Groundbed installations on the Houston Texas Gas and Oil Corporation's pipe line. The Deep Groundbed installation appears in the background. The Rectifier is mounted on the pole in the foreground.

CPS offers . . .

TURNKEY PACKAGED CATHODIC PROTECTION

An outstanding . . . turnkey packaged cathodic protection . . . installation was recently completed by CPS for the Houston Texas Gas and Oil Corporation on their 1600 mile pipe line from Baton Rouge, Louisiana to Miami, Florida. The cathodic protection was completed on the entire line within six months after the construction program was final.

As a corrosion engineering firm . . . CPS offers a client . . . turnkey packaged cathodic protection . . . for any protection job regardless of size. CPS will advise a client on all phases of design, plus the selection and installation of all materials needed to complete an overall corrosion mitigation program.

Contact CPS . . . let their experienced staff of engineers quote you on a turnkey packaged cathodic protection program. Your inquiry will save you money.

A copy of the paper entitled "Packaged Cathodic Protection Of The 1600 Mile Taped Coated Pipe Line to Florida" prepared by E. P. Doremus and Ralph B. Pass will be mailed to you upon request.

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Complete facilities for applying

ANCHORCRETE®

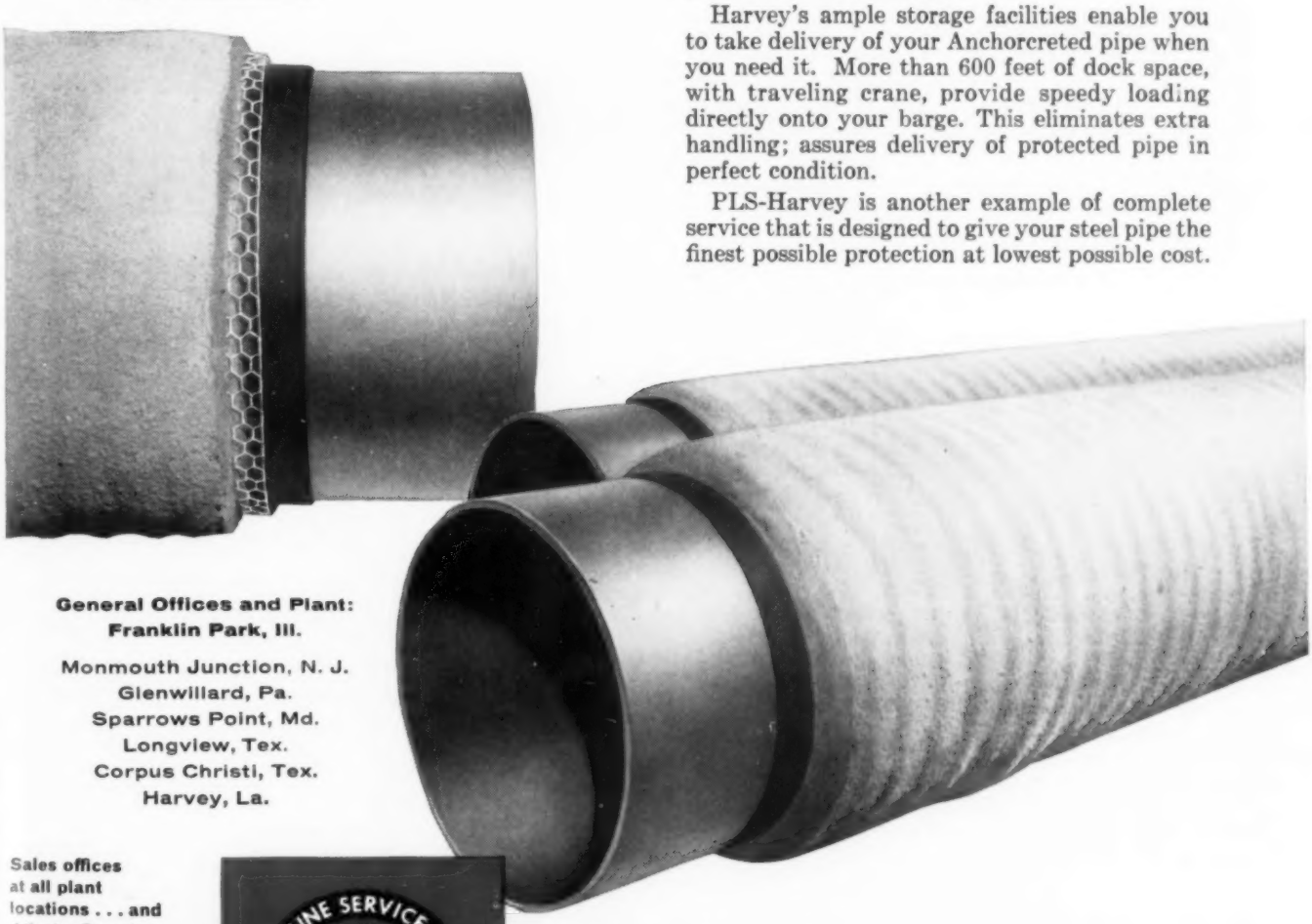
Concrete Coatings

When your pipelines require anchoring to offset buoyancy, remember that Pipe Line Service's Harvey plant is completely equipped to apply dependable "Anchorcrete" reinforced concrete coating over high-quality PLS coating and wrapping specifications.

From unloading the bare pipe to loading of the finished product, all operations are under one supervision . . . *one* responsibility. Uniform quality of Anchorcrete is assured through use of prime materials, careful batching, controlled mixing and thorough curing.

Harvey's ample storage facilities enable you to take delivery of your Anchorcreted pipe when you need it. More than 600 feet of dock space, with traveling crane, provide speedy loading directly onto your barge. This eliminates extra handling; assures delivery of protected pipe in perfect condition.

PLS-Harvey is another example of complete service that is designed to give your steel pipe the finest possible protection at lowest possible cost.



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Pipe Line Service Corporation

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A SUBSIDIARY OF AMERICAN STEEL FOUNDRIES

Quality pioneers in coating and wrapping pipe for over a quarter century

For more data on advertised products, use Readers' Service Cards, last page.

REPAIR PIPE LEAKS
QUICKLY
PERMANENTLY
ANY PRESSURE
ANY TEMPERATURE

SKINNER-SEAL
EMERGENCY PIPE CLAMPS for safe, sure lasting repair of splits and rust holes in pipe. No pressure too high. Anyone can apply in a few moments. Made in all sizes, ½" to 12", for steel and C. I. pipe. Stocked by practically all oil supply stores.

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COLLAR LEAK CLAMPS—for oil and gas lines. Gasket is sealed by gasket container rings—pressure is sealed in . . . air, moisture and gasket-destroying soil conditions are sealed out. Effective under any pressure. Sizes 2"—13" O.D. incl. In stock at oil supply stores!

For over half a century, a complete line of Repair Clamps and Saddles for steel and cast iron pipe. Send for catalog!

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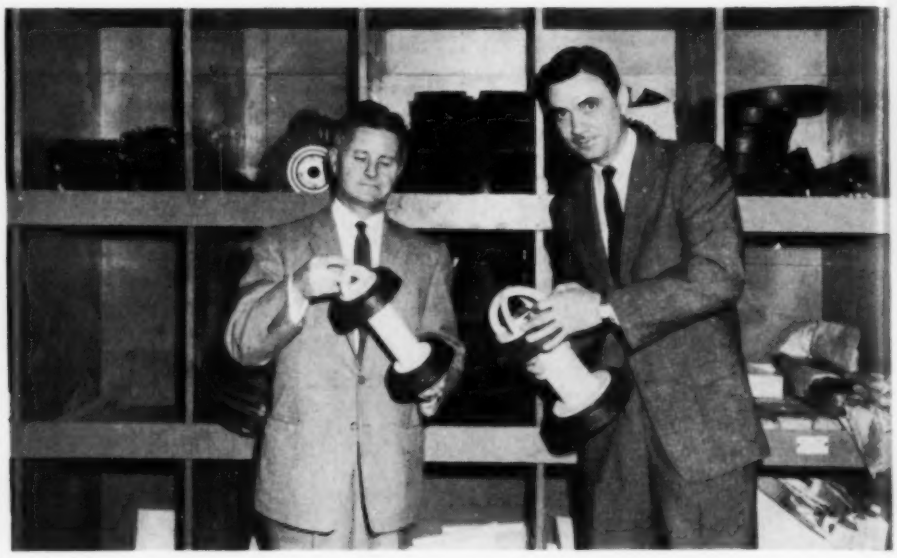
What's Happening among SERVICE and SUPPLY MEN



New Company Formed in Houston

John L. Long, left, and McArthur Hartt have formed the Pipeliners Equipment Manufacturing Corp., a Houston based firm. PEMCO will manufacture a line of pigs, clamps, combination pipe cleaning and taping machines, insulator and grinding machine. The Company also will distribute other products. Long and Hartt had been with Morris-Young-Owens Company prior to establishing the new company. PEMCO's plant is located at 2525 Magnet Street.

Dresser Industries Names George A. Peck SIE President

George A. Peck has been named president of Southwestern Industrial Electronics, a subsidiary of Dresser Industries. Peck succeeds Keith R. Beeman who has accepted a new position with the parent firm.

Peck had been vice president and general manager of the electronics division of Stromberg-Carlson Company. Prior to joining Stromberg-Carlson in 1942, he was associated with the General Cable Corporation; the Upson Company and Standard Cable Corporation. Beeman will be engaged in investigation of new product possibilities and broadening application of Dresser's present product line. Beeman is the co-founder of SIE, which was established in 1945.

National Tube Division Names James E. McDonald Tubing Manager

United States Steel's National Tube Division has appointed James E. McDonald manager, mechanical and pressure tubing products. McDonald joined the firm in 1946 and in 1948 was assigned to the Cleveland sales district. In 1953, he was transferred to the Pittsburgh sales office.

Crane Company Appoints Storch Manager of Engineering Sales

Crane Co. has named Alvin H. Storch, Jr., manager, sales engineer, for the Industrial Products Group. Formerly, he was associated with Chicago Pump Company as general sales manager. He was with Food Machinery and Chemical Corp., for over 12 years in a variety of engineering and administrative capacities.

His headquarters will be in Crane Chicago Works in Chicago.

Fuller Named Staff Engineer Of Automatic Electric Sales

Harris W. Fuller has been named a staff engineer for carrier and radio sales division of Automatic Electric Sales Corp., a subsidiary of General Telephone & Electronics.

He is responsible for providing technical advice and consultant service to telephone, railroad and pipe line companies on the application of carrier and microwave radio. Fuller joined the company in 1959. Previously he had been equipment engineer for Western Electric Co.

Tube Turns Plastics, Inc. Elects Erich Vice President

Tube Turns Plastics, Inc., has elected Earl A. Erich vice president. Erich joined Tube Turns, an affiliate of Chemetron Corporation, in 1955 as a specialist solving piping corrosion problems, and later was made head of sales program in West Texas and southwest. In 1956 he was promoted assistant sales manager and named sales manager in 1957.

COOL LIQUIDS OR GASES, condense vapors with TRANE Fluid Coolers, using air as the cooling medium. Unit shown is vertical discharge. Horizontal types also available—both in induced and forced draft arrangements.

Lower erection costs, operating costs ...with versatile Trane Fluid Coolers!

Air-cooling now solving water supply problems for many refineries, petrochemical and natural gasoline plants

More and more engineers and plant designers are finding that *air-cooled heat exchangers* eliminate water supply and maintenance problems encountered with conventional cooling towers. These engineers report a substantial net reduction in over-all cooling costs and water consumption. Here are some of the ways TRANE Fluid Coolers are helping to solve heat transfer problems in many refineries and plants:

- **Low first cost.** Erection is simpler; fan, motor and gearbox are factory-aligned on a single metal base. Framework parts are pre-drilled, match-marked. Compact, simple, TRANE Coolers can often be installed on roofs, cutting real estate costs.
- **Lower operating costs.** Equipment needs only periodic cleaning of fin-tube surface. No need for special crews, maintenance facilities or spare parts. And TRANE Fluid Coolers have a life expectancy of 15-20 years—compared with 7-10 years for cooling towers.
- **Superior performance.** TRANE Coolers available with Admiralty stainless and carbon steel tubing to meet the most exacting specifications. Units are now in use in Canada and Bermuda—meeting extreme weather conditions. They also solve the problem of corrosion caused by salt-air atmosphere.

WANT MORE FACTS?

New Catalog S-395 has complete specification and application data on TRANE Fluid Coolers. For your copy, write TRANE, La Crosse, Wisconsin. Or just call your nearby TRANE Sales Office.

For any air condition, turn to

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MANUFACTURING ENGINEERS OF AIR CONDITIONING, HEATING, VENTILATING AND HEAT TRANSFER EQUIPMENT

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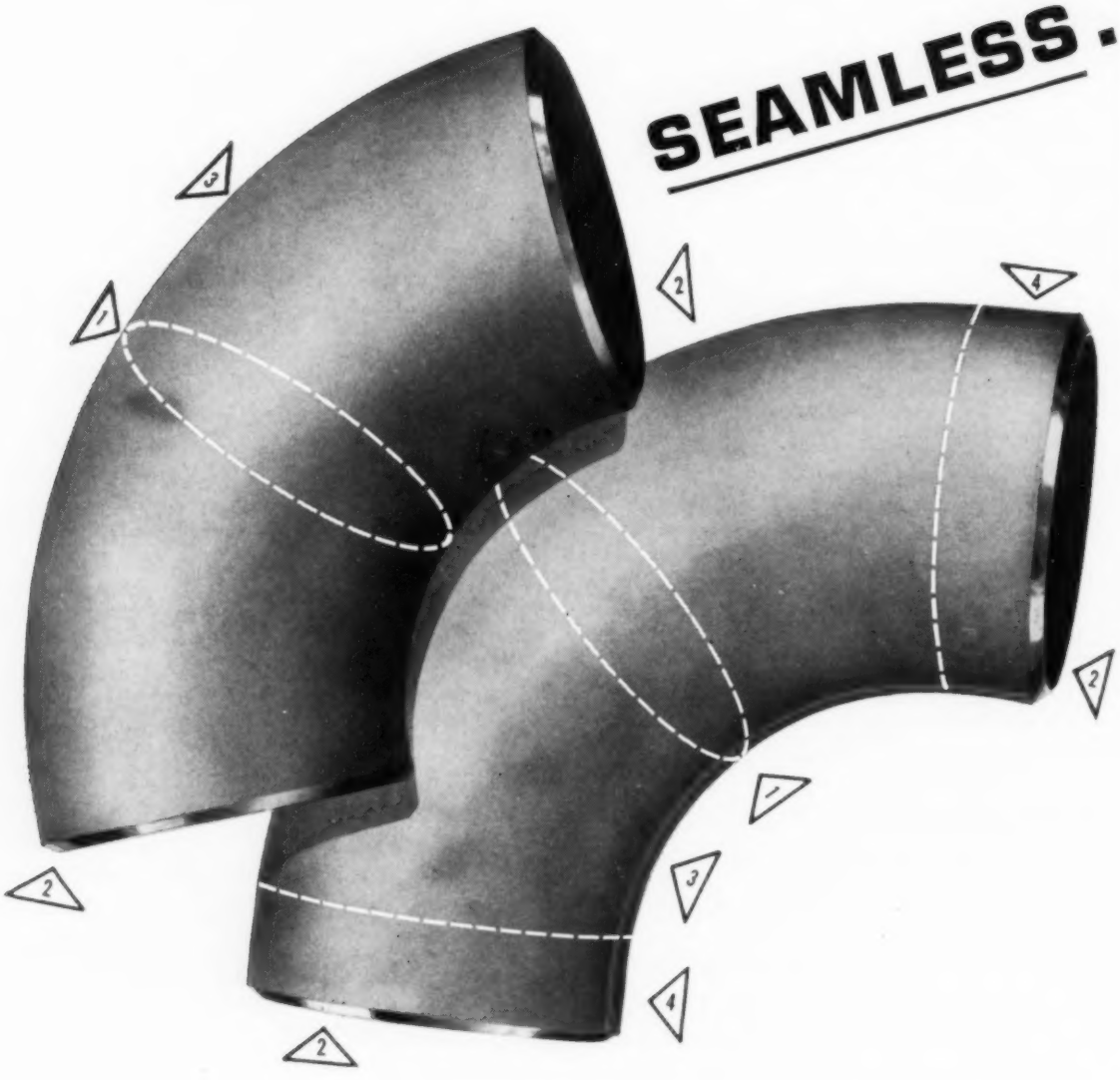

1. BONUS... All fittings hot-coined in compression throughout entire length—dimensionally true to permit segmenting at any point. **2.** BONUS... Seamless and welded-type fittings with specially machined ends assure uniform thickness and diameters . . . ends that are circle-perfect, plumb and square. **3.** BONUS... Wall thickness and uniformity—greater than required by ASA Standards. **4.** BONUS... Long Tangent bonus on welded-type fittings—NO EXTRA COST—saves pipe, simplifies lining-up, eliminates short welded stubs.

..BY MIDWEST

NEW! The finest *seamless* welding fittings ever made. NOW—a hot-coined fitting, dimensionally accurate from end to end . . . fittings forged at controlled heat for superior metallurgical quality . . . with specially machined ends for quickest fit-up and welding! Produced by the newest and most modern equipment—combined with the latest technology in forging, sizing, heat-treating, and machining. Available in all sizes through 24″—long radius or short—90's, 45's, 180's.

WELDED . . . BY MIDWEST

Welded-type fittings, fully reinforced . . . especially "Long Tangent" bonus fittings . . . always available from stock in carbon steel through 36″ (to order through 48″)—same high quality as always. Also available from stock in wrought iron and chrome-moly. Fittings formed from plate and welded are ideally suited to unusual requirements—heavy wall (2″, 3″, 4″ or more) . . . Hi-Yield, Inconel, stainless, Hastelloy and all other weldable metals. Extra tangent lengths, reducing ells, and special fittings of all kinds are made best as welded-type fittings.

THE WORLD'S MOST COMPLETE LINE OF WELDING FITTINGS . . . sold through stocking distributors from coast to coast.

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Write for NEW brochure
SEAMLESS AND WELDED-TYPE
FITTINGS, No. 60-C

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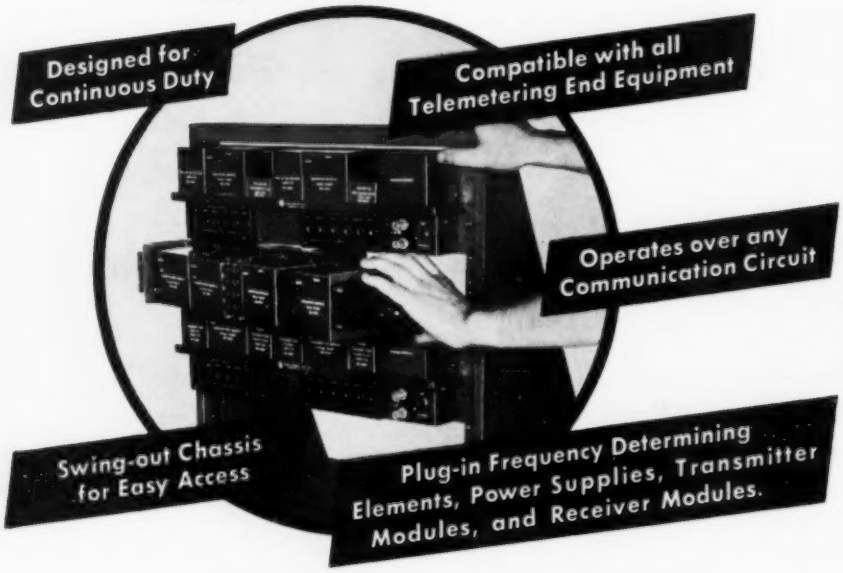
REMOTE INSTRUMENTATION & CONTROL

Comtel® Transistorized Modular Terminal Units for TELEMETERING and CONTROL APPLICATIONS


Designed for Continuous Duty
Compatible with all Telemetering End Equipment
Operates over any Communication Circuit
Swing-out Chassis for Easy Access
Plug-in Frequency Determining Elements, Power Supplies, Transmitter Modules, and Receiver Modules.

The Model 1220 and 1220A Carrier Terminals are completely transistorized and may be operated from station batteries from 12 to 130 DC. Plug-in power supply is available for 115-volt AC operation. All components, including amplifiers, frequency determining components, and power supplies are contained in plug-in modules, and may be readily interchanged. As many as 22 high-speed channels are available between 300 to 3000 cps.

MODEL 1220

The Model 1220 Terminals are normally used in telegraph applications and provide all necessary carrier and loop jack fields, as well as loop current controls. Two transmitters, two receivers, or a transmitter receiver are available on a single 5¼" x 19" chassis. Operates from station battery or 117-volt AC line.

MODEL 1220A

The Model 1220A Terminals are normally used in telemetering and control applications. The individual modules are mounted on a swing-out chassis and are readily accessible. Four transmitters, four receivers, or two transmitter receivers are available on a single 3½" x 19" chassis. Operates from station battery or 117-volt AC line.

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SEND FOR TECH. DATA — For additional information, including application data, write or phone DE 4-3100. Demonstrations available by local representatives.

RFL Radio Frequency LABORATORIES, INC. Boonton, New Jersey, U.S.A.

L. L. Warriner

Grant C. Woodard

L. L. Warriner Elected Chairman of the Board

Cooper-Bessemer Corporation announces the election of L. L. Warriner as chairman of the board of directors. Grant C. Woodard, general sales manager, and Harold C. Johnson, manager of manufacturing, were named vice presidents.

Harold C. Johnson

Warriner succeeds L. F. Williams who had served with the company for 40 years. He will continue as director and a member of the executive committee. Warriner had been management and engineering consultant and has been a director for the past 15 years. He has served in executive posts with Fairbanks-Morse Company; A. O. Smith Corporation; Summitville Consolidated Mines and The Master Electric Company. In 1956, he began his management and engineering consultant work. Woodard will be vice president of marketing. He has been with Cooper-Bessemer since 1948. He became general sales manager in 1957. Johnson is vice president of manufacturing. He joined the company in 1946 and was promoted to manager of manufacturing for the Mount Vernon and Grove City, Pa., plants in 1957.

Minnesota Mining Appoints Louis F. Weyand Vice Chairman

Louis F. Weyand has been appointed vice chairman of the executive committee by Minnesota Mining & Manufacturing Co. J. F. Whitcomb was elected divisional vice president in charge of coated abrasives and related products division.

Weyand had been a member of the board since 1950, and until recently, executive vice president and director of sales. He joined the company in 1915, and became a vice president in 1946, and executive vice president for tape and allied products in 1952. He was named director of sales in 1955. Whitcomb has been with Minnesota Mining since 1935, and became divisional manager in 1955. He was named general manager in 1959.

Proportioneers, Inc. Names R. H. Granville President

Robert H. Granville has been named president of Proportioneers, Inc., division of B-I-F Industries. He joined Proportioneers in 1950 as chairman of central engineering and manager of synchro-master division. He was made vice president in 1952 and manager of Proportioneers in 1956.

NEW ANSCO X-RAY SAMPLES tailored to your needs

Free on request

Ansco

Industrial X-ray Materials

Interested in improving your overall radiographic quality? Here's your opportunity! This new Ansco X-ray Sampler will be tailor-made to suit your needs in both film and chemicals. So just fill in and mail the coupon. Soon you'll be testing the best . . . Ansco!

FREE! Illustrated booklet of case histories where radiography and photography have helped increase business efficiency. Wouldn't you like a copy for yourself? See your Ansco representative. Ansco, Binghamton, N. Y., A Division of General Aniline & Film Corporation.

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Binghamton, New York

YES! I want to make a critical test of Ansco Industrial X-ray Materials. Please provide additional information on how to obtain a X-ray sample kit.

NAME_____

POSITION_____

COMPANY_____

TELEPHONE NO._____

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D

For more data on advertised products, use Readers' Service Cards, last page.

"Torture tests prove W-K-M performance"

Continuous research and rigid testing give W-K-M customers constantly improved valves and fittings. In this test cell, for example, W-K-M products are tested far beyond calculated limits of endurance . . . even to complete destruction.

Specify W-K-M! You'll get superb quality and unmatched dependability. Write for literature on W-K-M products.

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DIVISION OF ACF INDUSTRIES INCORPORATED
P. O. BOX 2117, HOUSTON, TEXAS

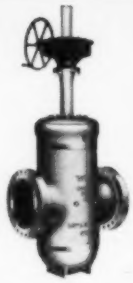
Products of W-K-M's *Creative Engineering*

W-K-M® Through-Conduit Gate Valves for Oilfield Services —Catalog 200

W-K-M's Pressure Sealing Gate Valves (ASA)—Catalog 1200

ACF non-lubricated Ball Valves— Catalog 1000

KEY-KAST® Alloy Welding Fittings— Quality Control Specifications 102958 and 103058



W-K-M Through-Conduit Gate Valves (ASA)—Catalog 300

ACF® lubricated Plug Valves—(Semi-Steel) Catalog 400, (Steel) Catalog 1100

KEY® Refinery Fittings and Return Bends— Bulletin KR-1257

3927

Gray Named Service Engineer For Reilly Tar & Chemical Corp.

Reilly Tar & Chemical Corporation has appointed Glen R. Gray Western service engineer. He will service coal tar enamel pipe line coating installations in the southwest and western districts. Headquarters will be in Dallas.

Gray was associated with El Paso Natural Gas Company from 1954 until 1959, as an electrolysis engineer and chief inspector in charge of the coatings laboratory.

International Harvester Promotes William T. Murphy

William T. Murphy has been appointed staff assistant to Clarence A. Hubert, general manager of International Harvester Company's Construction Equipment Division. Murphy had been staff assistant to Russell F. Denney, division manufacturing manager.

Murphy's assignment will include manufacturing functions, but also engineering, sales and supply and inventory responsibilities, in addition to procurement of major machines.

Cris Matthews Appointed Midwestern Vice President

Midwestern Pipe Line Products Company has appointed Cris Matthews district representative. He will be headquartered in Tulsa and will cover Oklahoma, Arkansas, northern Louisiana, western Tennessee, western Kentucky, southern Missouri and north Texas.

Cris Matthews

Matthews formerly was sales manager for Southern Pipe Coating Company for three years. He was with Barrett Division of Allied Chemical and Dye Corporation for eight years and had been in the corrosion section of Phillips Petroleum for three years.

Arthur J. Laack Appointed FWD Merchandising Director

Arthur J. Laack has been appointed by FWD Corporation as director of merchandising. He has been manager of the advertising and sales promotion division since 1955. In his new position, he will continue as advertising director and coordinate merchandise and implement all product promotions.

Prior to joining the company he had been assistant to the advertising manager of Trane Company.

Tex-Tube, Inc. Opens Branch in Amarillo

Tex-Tube, Inc., has opened a new branch office in Amarillo, Texas, to serve the Texas Panhandle area. Thomas J. Nance becomes the Panhandle Division manager with offices in the Petroleum Building.

Nance had been field engineer for Tex-Tube prior to his new assignment. Previously he worked with Humble Oil & Refining Company and San Jacinto Oil and Gas Company.

Napko Corp. Appoints Valois Industrial Sales Representative

Napko Corp. has named Marcel L. Valois industrial sales representative for the Baton Rouge, La., area. Prior to joining the company in 1959, he was factory representative for a firm specializing in coatings for the Gulf Coast area.

Longhorn Supply Company Promotes Morris and Armstrong

W. F. Morris has been appointed vice president, and Vesper Armstrong, Jr., secretary-treasurer, of the Longhorn Supply Company. Mrs. Geraldine F. Irwin was promoted to assistant to Armstrong. Morris has had 25 years experience in the industry. He joined Longhorn in 1947, was named purchasing agent in 1953, and general manager in 1955. Since 1958 he has been secretary-treasurer.

Armstrong had been associated with the Houston certified public accounting firm of Ernst and Ernst.

Bill Wood Appointed Central Region Manager

Bill Wood has been appointed regional manager of Jones & Laughlin Supply Division's newly formed central region with headquarters in Tulsa.

Wood joined Jones & Laughlin in 1952 as salesman at Natchez, Miss., and was moved to New Orleans in 1955. He was made manager of the Tulsa City Sales office in 1957.

BUT Oil Gaging Needs Precision Equipment from W. H. Curtin & Co.

Complete stocks of Petroleum Gaging Equipment meeting all API and ASTM specifications are maintained for immediate delivery by W. H. Curtin & Co. Curtin oil testing centrifuges and tubes, thermometers and hydrometers, as well as all other gaging equipment, are of the finest quality and constructed for a long lifetime of use in field or laboratory. Replacement parts are readily available for all equipment. On your next order, specify the high quality gaging equipment you can rely on from W. H. Curtin & Co.

Write or call for your FREE copy of Curtin's 24-page illustrated catalog G-56 *Petroleum Gaging Equipment.*

W. H. CURTIN & CO.

DOMESTIC EXPORT • CURTIN

PETROLEUM TESTING EQUIPMENT

HOUSTON - DALLAS - NEW ORLEANS - JACKSONVILLE

Sales Offices: TULSA • BIRMINGHAM • CORPUS CHRISTI

Subsidiary: CURTIN DE MEXICO, S.A. de C.V., MEXICO CITY

Established 1922 U.S.A.

For more data on advertised products, use Readers' Service Cards, last page.

On the Job with

IN PENNSYLVANIA—Transco's 164-mile Leidy Line, connecting their main line with a new storage field in the north-central part of the state, requires some of the Bethlehem 24-in. pipe to be laid almost straight up.

IN NEW MEXICO—Utex Exploration Company and Charles A. Steen of Moab, Utah, build a gathering line by laying 3-in. Bethlehem buttweld pipe right on the surface of the ground.

Our new mills are geared to turn out pipe in larger tonnages than ever before. And it's line pipe that's thoroughly dependable, too. Every length is straight and true to round and bevel, right up to specs, and rigorously tested and inspected at the mill.

It's easy to check all the facts about Bethlehem Line Pipe—just call the Bethlehem sales office nearest you.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA., *Export Distributor.* **Bethlehem Steel Export Corporation**

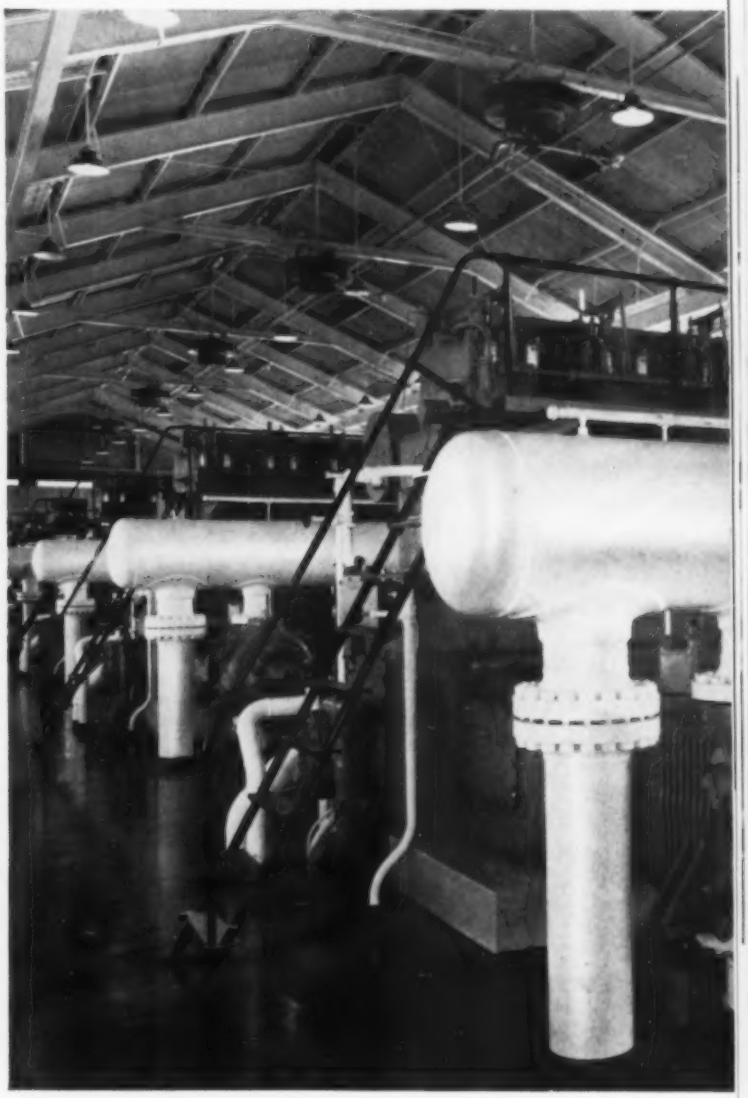
For strength
. . . economy
. . . eye-appeal

Steel

Bethlehem Line Pipe

IN VIRGINIA—Commonwealth Natural Gas Corporation pushes a looping line through the tangled Blackwater Swamp. The Bethlehem 12¾-in. pipe weathered the construction battle perfectly.

FROM COLORADO TO CANADA—Pacific Northwest Pipeline Corporation's 1,487-mile main line required 13 compressor stations, each using Bethlehem 22- and 26-in. Mayari R high-strength pipe exclusively.



NOW AVAILABLE IN ALL SIZES MEETING API SPECIFICATIONS

	SIZES (in., OD, incl.)	WALL THICKNESS (in.)	LENGTHS	SPECIFICATIONS
HYDRAULICALLY EXPANDED ELECTRIC FUSION-WELD (submerged arc)	18 to 42	¼ to ¾ incl.	40 ft	API 5LX, Grades X42, X46 & X52 Also X-56 (non-API)
ELECTRIC RESISTANCE-WELD	5⅝ to 16	API	to 60 ft	API 5L, Grades A & B API 5LX, Grades X42 & X46
CONTINUOUS BUTTWELD	½ to 4½	API	SRL 24 to 26 ft DRL to 50 ft	API 5L

BETHLEHEM STEEL

BETHLEHEM STEEL

RENT

Everything for pipeline construction from

MYOCO

PIPE WRAPPING MACHINES
COATING & WRAPPING
CLEANING & PRIMING
ASPHALT KETTLES
PIPE CRADLES
BEVELING MACHINES
INTERNAL LINE-UP CLAMPS
EXTERNAL LINE-UP CLAMPS
HOLIDAY DETECTORS
PIPELINE LOCATORS

Why tie-up your capital in purchasing equipment, when you can rent all these items, and numerous others, for pipeline construction. And you get around-the-clock service from our experienced personnel . . . dependable operation of equipment assured by periodical checks. No delay, parts and supplies shipped same day ordered when possible.

WRITE FOR CATALOG

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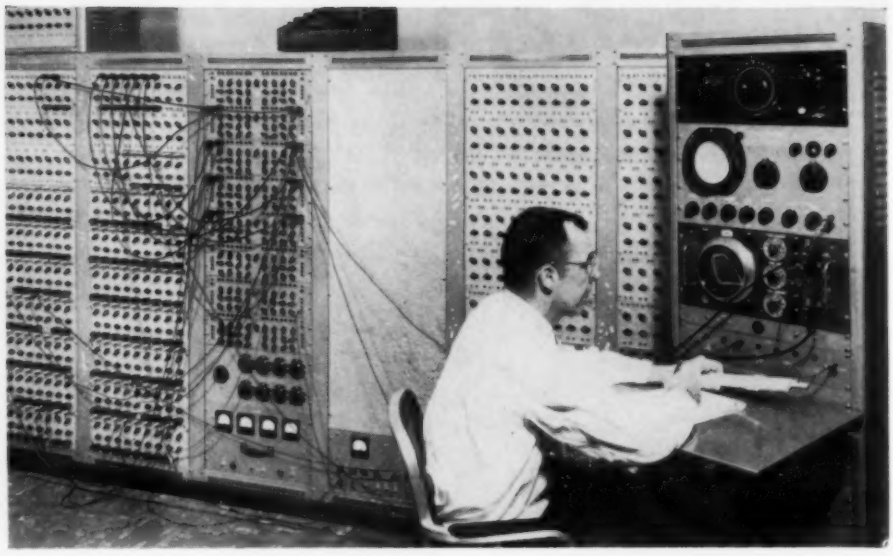
PIPELINE EQUIPMENT AND SUPPLIES
P. O. Box 35137 • Houston 35, Texas
PArkview 3-0110
In Canada: MYOCO LIMITED, Rural Route 1, Midland Ave. N., Agincourt, Ontario, Canada
Tel. WA 2-9444



Worthington Installs Electrical Analog

Worthington Corporation has installed its newly developed electrical analog system at its compressor and engine plant in Buffalo, N.Y. The electronic machine allows engineers to create electrical circuit analogies which predict machine and system performance before design and construction are finalized.

ACF Appoints H. C. Hopkins Vice President Purchasing

Harry C. Hopkins has been named vice president for purchasing of ACF Industries, Incorporated. He will coordinate purchasing activities of the company's operating divisions and will direct purchases from the standpoint of policy.

Hopkins has had 35 years experience in the industry and in recent years has served as president of King Container Corporation.

Motorola Establishes Eastern Headquarters in New Jersey

Motorola Communications & Electronics, Inc., has established an Eastern headquarters in Fair Lawn, New Jersey, for sales and service of public safety and industrial communications products.

Approximately 18,000 square feet of space is available in the building. The new center serves 15 Eastern states and the District of Columbia.

Lunkenheimer Names Callaway Dallas Sales Representative

J. R. Callaway has been appointed Dallas sales representative for Lunkenheimer Co. In addition to the Dallas-Ft. Worth area, Callaway will cover North Texas, Lubbock, Midland and Odessa, Texas, and Hobbs, N.M. area.

Callaway had been production manager for an independent oil producer the past several years.

Shand and Jurs Names Fournier New York District Sales Manager

George A. Fournier has been named Shand and Jurs New York district sales manager. He replaces R. F. Ley, who will carry out special assignments with regard to the company's export accounts. Fournier joined the company in 1949 as a sales engineer. He recently had been assistant manager of the New York district sales office.

General Electric Company Promotes Paul D. Williams

Paul D. Williams has been appointed manager of Marketing Administration for General Electric Communication Products Department. He will be responsible for commercial service, order processing, sales forecasting and marketing budgeting for communications products.

CLASSIFIED ADVERTISING

SALESMAN WANTED

Well-established successful firm has opening in an expanding sales department for young man looking for an opportunity in sales work. Must be college graduate, not over 33, in good health, ambitious and not afraid of work. Oil industry experience desirable. The man we are looking for will be trained at home office before moving into sales work on basis of salary plus commission incentive and traveling expenses. Our own personnel know of this advertisement. Your reply will be confidential and should be sufficiently complete to merit contacting you for an interview. Address Box 56-P, PIPE LINE INDUSTRY, Houston, Texas.

DRAGLINE MATS

Any Length, Width or Built to Specifications

We build them a little better For a little less

STRICTLY HARDWOOD
Also LUMBER AND PILING

KENT PILING CO., INC.

T. W. "TOM" KENT, PRESIDENT
Phone Day: Amite 2641 — 2644
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FLUKER, LOUISIANA

CLOSE TO HOME, PUMP-WISE AND SERVICE-MINDED!

—Your Gaso Distributor

Edmonton, Alberta

Casper, Wyoming

NEW YORK

Evansville, Ind.

TULSA, OKLAHOMA

Brookhaven and Tinsley, Miss.

Shreveport, La.,

Wichita Falls, Texas

Odessa, Texas

Houston, Texas

Bakersfield, Cal.

Farmington, N. M.

Long Beach, Cal.

GASO DISTRIBUTORS BRING GASO SERVICE TO YOUR BASE OF OPERATIONS

We screen and pick our distributors with the utmost care. We bring their organizations to Tulsa for thorough training in oil-industry pumps and their application. We insist that they carry stocks of Gaso Pumps and parts.

Result: Complete Gaso service at your doorstep. Time-saving. Convenient. Still another explanation of the worldwide preference for Gaso Pumps.

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GASO PUMPS

for every oil industry need

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SEE the 75,000-lb. lift.....

• with "go anywhere" long-track traction
• "get done faster" full-reverse transmission; Shuttle-Bar control!

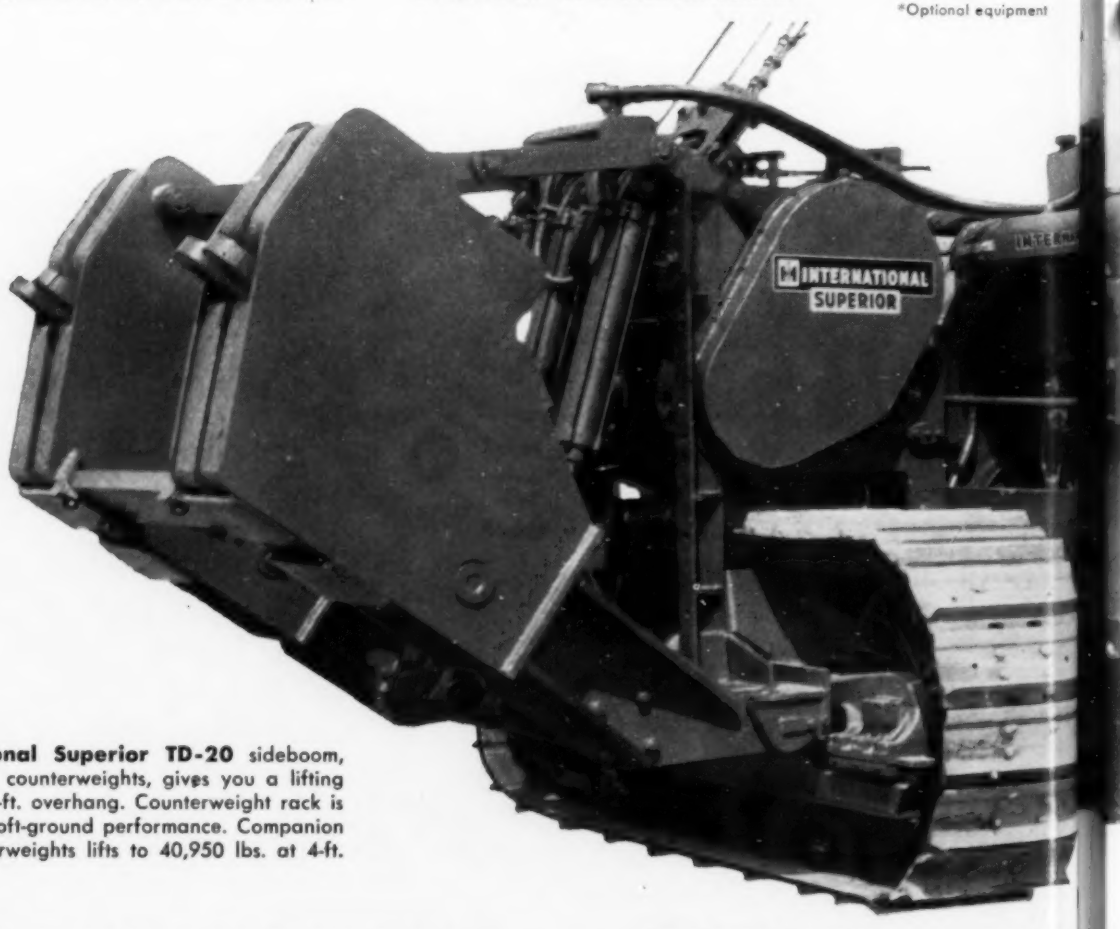
Now, beat "tough-problem" terrain—get big-inch lift capacity of up to 75,000 lbs.—get amazing new hill-hugging stability and bog-beating traction. Put the new 134-hp International Superior TD-20 sideboom to work! With the new 7 roller* tracks and 24-inch shoes, the TD-20 sideboom gives you the tremendous ground contact area of 5232 square inches!

Along with this new stability the new TD-20 gives you new mobility to speed up all tractor-powered phases of pipelining. The new 6-speed full-reverse transmission gives you a forward or back-up speed range to fit every carry or travel situation.

You take fast advantage of forward speeds up to 7.0 mph and reverse speeds up to 8.4 mph! Simply move the exclusive minute-clipping Shuttle-Bar forward or backward for instant forward-reverse direction changing with or without gear changing! You get super-fast pipe-handling control with minimum operator effort with International Superior reach-easy control lever clusters. You get exclusive gear-driven drum shafts that operate without adjustment, clatter, or backlash. You get the cable life protection of fleeting sheaves—"minute-change" counterweighting—many other years-proven advantages.

Press the button of the positive, seconds-fast gasoline conversion starting system. Put the 134-hp TD-20 Sideboom through its production-boosting paces. See how Shuttle-Bar Control can speed-up your operations—how TD-20 stability and traction increase operator confidence. And try out TD-20 sideboom safety and ease of control. See your International Superior Distributor for a demonstration.

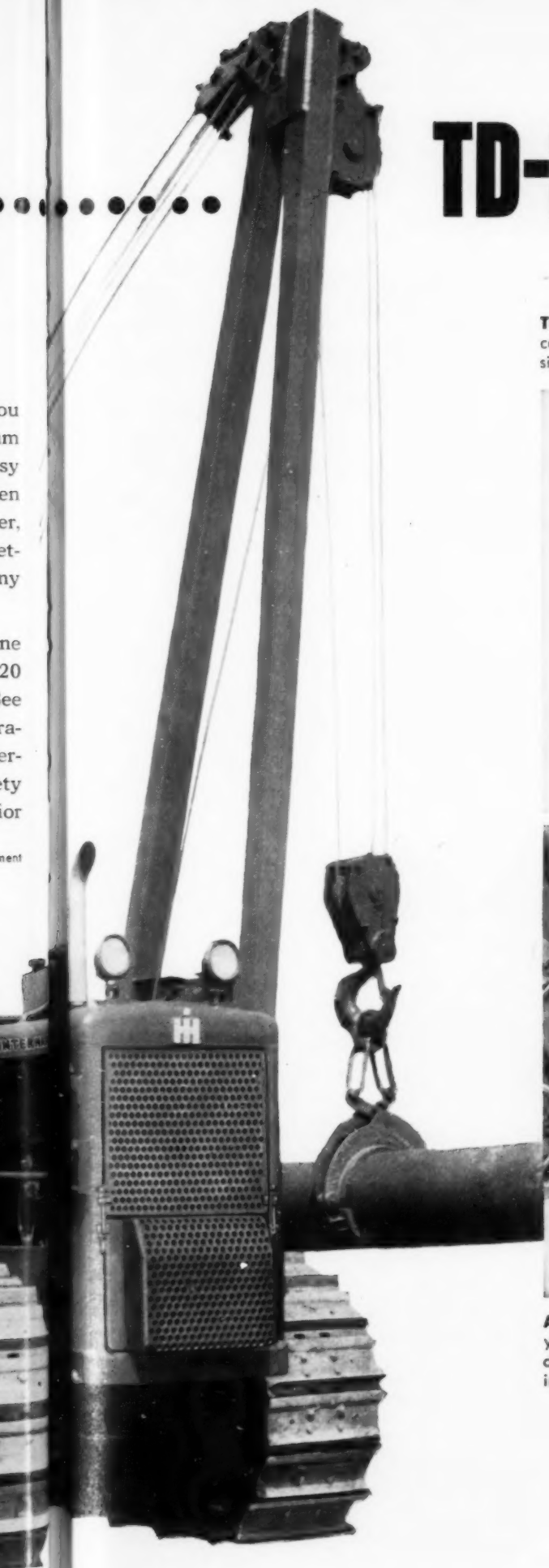
*Optional equipment



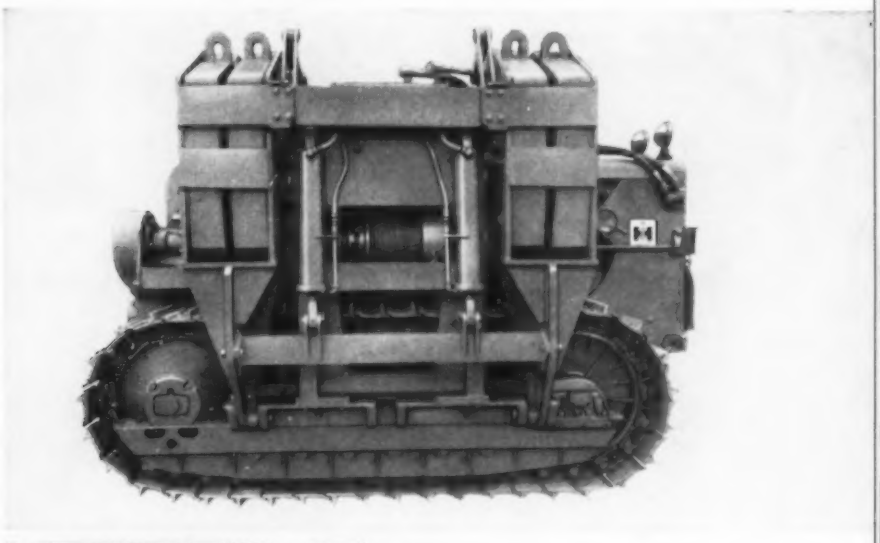
Weights can be fully extended in 3 to 4 seconds—and held in any intermediate position by the two large, double-acting jacks, under hydraulic control.

New 134-hp International Superior TD-20 sideboom, with hydraulically extended counterweights, gives you a lifting capacity of 75,000 lbs. at 4-ft. overhang. Counterweight rack is bottom-hinged for efficient soft-ground performance. Companion model with standard counterweights lifts to 40,950 lbs. at 4-ft. overhang.

TD-20 Sideboom



The four pin-locked counterweights of either TD-20 sideboom model can be racked or removed in minutes! It's easy to counterweight a TD-20 sideboom to match load and terrain.



Add this blade backfiller—and save the cost of a backfilling machine on your spread—for a small fraction of a complete dozer outfit's cost! Backfiller does not interfere with sideboom operation; can be put on or taken off in minutes!

International Harvester Company, Chicago 1, Illinois

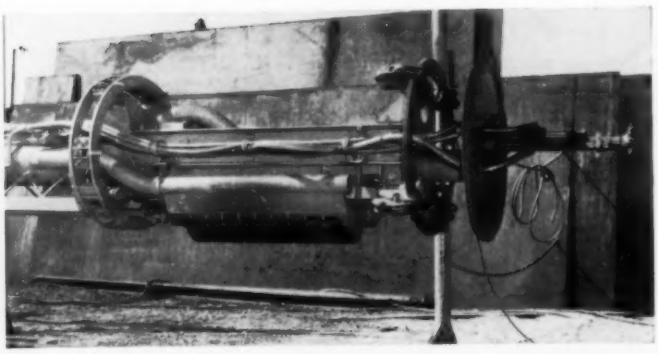
INTERNATIONAL®

SUPERIOR

For more data on advertised products, use Readers' Service Cards, last page.

What's New in EQUIPMENT

To receive more information on all new equipment articles use Readers' Service Card, last page of this issue.



Crose-Perrault Develops Internal Coating Machine

An internal cleaning and coating machine for pipe from 10-inch to 36-inch has been introduced by Crose-Perrault Equipment Corp.

A circular brush mounted on the leading end of a boom, which enters the pipe, cleans the inside as the pipe is rotated. On retracting the boom assembly, pipe is cleaned again while a spray head applies the specified coating to pipe. Wire brush consist of circular brushes which rotate at over 2500 rpm. Air pressure on the brush-head actuating cylinders is adjusted to any desired pressure. Cylinders also allow brush-head to retract as pipe entry is made to minimize damage and wear. Electric brush-drive motor permits operator to reverse the brush rotation, preventing wires from wearing on only one side.

Coating is applied on 360 degree spray head located on extreme forward end of boom. An airless type spray system which utilizes hydrostatic pressure for coating atomization is employed in painting system. This reduces overspray and coating bounceback and is designed to give a more uniform coating on inside of pipe.

Controlled from a push button console, the machine is electrically powered for ease of operation. Operator does not ride the boom; limited crew of one operator, two piperollers and one man to maintain coating supply is all that is needed for the system.

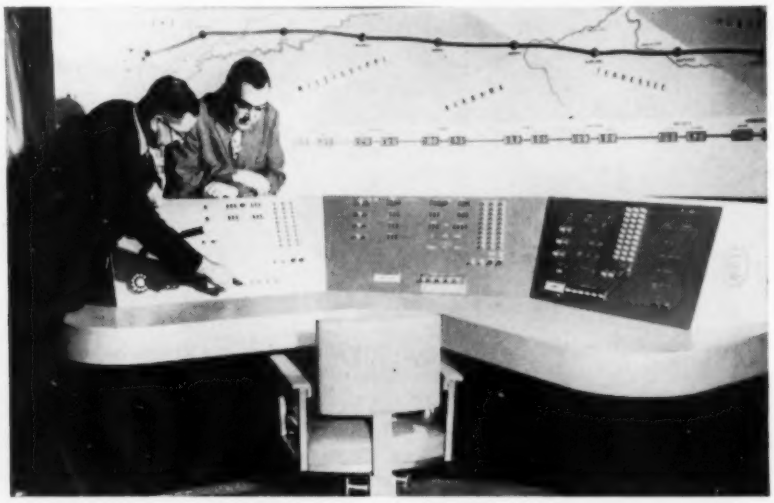
A pipe rolling table is used to spin pipe during cleaning and coating operations. Pipe is positioned over single turning rollers by hydraulically operated clamping arms. In-coming pipe skids, with built-in automatic feed-in trips and powered positioning rollers, are supplied as standard equipment.

The system is capable of cleaning and coating a 40-foot joint of 30-inch pipe every minute. To remove dust and scale from pipe after it has been broken loose by brush, a vacuum pick-up system sucks dust out the back end of the boom.

Two different booms are used on pipe from 16 through 24-inch pipe and 24-through 36-inch pipe. If the electric system should fail while in operation, the paint shut-off and brush automatically raise.

(This item supplements M. J. Crose Manufacturing Co. Inc. data on pages 137-138 and Perrault Equipment Co. data on page 345 of Pipe Line Catalog, Second Revision.)

For more data, circle **No. E1** on Readers' Service Card, last page this issue.



Pipe Line Controls

Union Switch & Signal has completed a compact centralized control console for dispatching an entire pipe line system. The centralized transport control system was designed to place the control of a 900-mile pipe line, Columbia Gulf Transmission Company, at the dispatcher panel. Current, pertinent operating information for the system is continuously displayed.

The dispatcher can monitor operating conditions and adjust rate of flow and pressure at major points, operate remote stations, sequence any engines at such stations, shut down a station when necessary, control discharge pressure and accurately control the flow along the line.

Elements included in the integrated control are digital remote control, digital telemetering, sequence control, instrumentation, data handling, computation, data for accounting and coordinated communications. The control center is linked to stations by leased communications circuit. Coded signals, a different one for each control function, are initiated on the board and travel over the circuit to the station. There, coded signals actuate relays which, in turn, carry out orders received from the board. Digital methods and codes are designed for common language acceptance by major digital computers. Information can be programmed automatically into a computer or logic device, or transferred automatically into accounting. Data may be recorded on log sheets, tape or cards for other uses. The system is designed "open-ended" to facilitate future additions.

(This item supplements Union Switch & Signal data on pages 449-452 of the Pipe Line Catalog, Second Revision.)

For more data, circle **No. E2** on Readers' Service Card, last page this issue.

B&W JOB-MATCHED WELDING FITTINGS

make piping systems permanent and leakproof

. . . you get positive fit-up to pipe which means welding is easier, faster and more sure

. . . you get dimensional accuracy which means that, with a sound weld, piping is maintenance-free for the life of the system

. . . you get extra long life because you can choose the correct steel for your application

Specify B&W Welding Fittings and Flanges on your next piping job. They're available in a complete range of types and sizes in carbon steel and, of course, the famous B&W CROLOYS. Call your local B&W District Sales Office or any qualified welding fittings distributor. The Babcock & Wilcox Company, Tubular Products Division, Beaver Falls, Pa.

TA 9025-WF3

B&W THE BABCOCK & WILCOX COMPANY

TUBULAR PRODUCTS DIVISION

Seamless and welded tubular products, solid extrusions, seamless welding fittings and forged steel flanges—in carbon, alloy and stainless steels and special metals

Wheeled Tractor

A versatile wheeled tractor powered by gasoline engine has been introduced by J. I. Case Company. The Model W-3 is primarily designed as a 2500 pound capacity loader and 3000-pound capacity backhoe, it can function with a wide choice of interchangeable equipment, including crane boom, dozer, all-purpose blade, log and pallet forks, scarifier-scraper, post-hole digger and cutter-bar or rotary mowers.

The W-3 engine is a 52 horsepower, high-torque, OHV engine. It is equipped with an 11-inch diameter master clutch and extra-long main and connecting rod bearings. Hydraulic torque-Converter drive gives greater push power. A synchronized shuttle transmission that permits smooth shifting and a hydraulically actuated power-steering system provide ease in operation of tractor. A heavier-duty backhoe digs to a depth of 14 feet, reaches 20 feet from the front axle, and has an operating radius of 16 feet to 9 inches from pivot. Hydraulic foot-operated swing controls enable operator to swing the hoe boom a full 180°. All working members of the W-3 backhoe-loader are made of high-strength alloy steel. The swing mechanism is equipped with a heavy duty, self aligning ball-socket connection, with a load carrying capacity of 380,000 pounds.

For more data, circle **No. E3** on Readers' Service Card, last page this issue.

HYDROSTATIC PIPELINE TESTING

EXPERIENCE MAKES THE DIFFERENCE

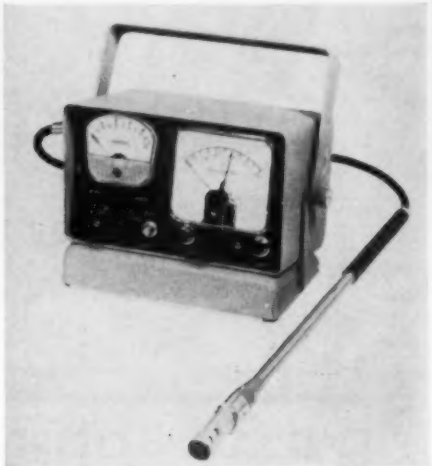
...and a world of experience in testing thousands of miles of pipelines makes the difference in every Williams testing job.

Williams
PRESSURE SERVICE COMPANY

Call Shreveport 4-2678

2000 BECK BUILDING
SHREVEPORT, LOUISIANA

SPECIALLY DEVELOPED EQUIPMENT • COMPLETE TESTING SERVICE
EXPERIENCED TESTING ENGINEERS



Gas Detector

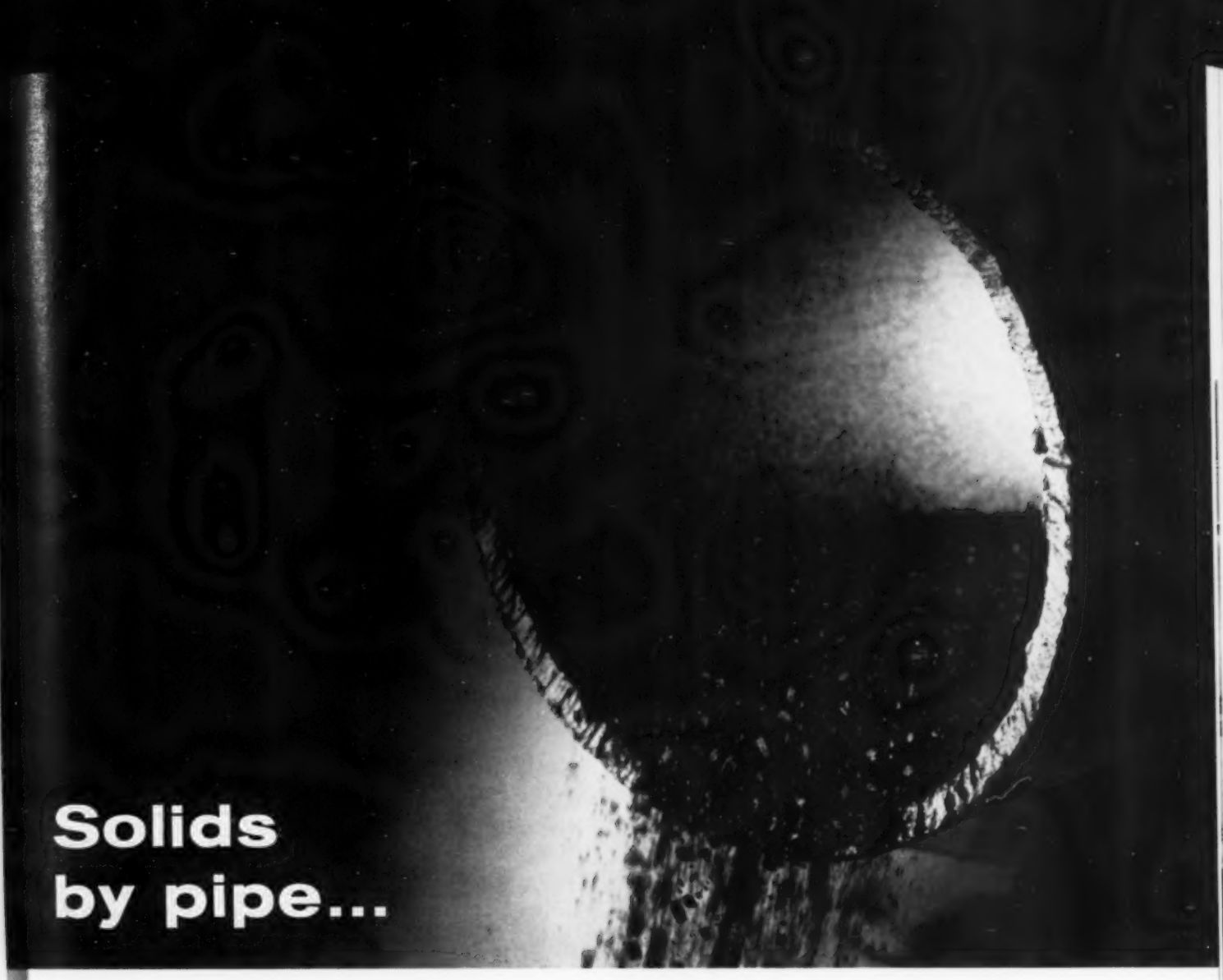
Designed to give indication and alarm when gas concentrations reach unsafe levels, a new probe gas detector has been developed by Houston Instrument Corporation.

The unit can be operated as portable instrument with handy probe type element or as fixed indicator/alarm with up to 100 feet of cable to detector element. Portable power is supplied by built-in solid electrolite nickel-cadmium battery and battery charger. It also can be operated directly from 110 V.A.C. source. It is calibrated in percent of lower explosion limit of desired gas. Adjustable meter trip provides alarm circuit for a built-in buzzer alarm. Auxiliary contacts are provided for external alarm or shutdown circuits.

For more data, circle **No. E4** on Readers' Service Card, last page this issue.

Gas Turbine Engine

Solar Aircraft Company announces first unit of a new line of gas turbine-driven centrifugal gas compressors. The compressor will be used on a Trunkline Gas Company station.



Can you meet the challenge of this new day in bulk transportation?

Will you be in the running when the pipeline industry's biggest new job starts taking shape?

Solids by pipeline is no longer a dream. It's a highly successful reality.

Gilsonite . . . coal . . . *what raw material will be next* to start moving to market through a pipe?

As you get set to meet the mighty challenge and opportunity that solids pipelining presents to your industry, remember this:

1. Men who engineer solids pipeline systems find that *uniform concentration* of solids is a must in a pipelined slurry.
2. You can get the slurry uniformity you want—with LIGHTNIN Mixers.

LIGHTNIN Side Entering Mixers keep 700 tons of solids per day uniformly suspended for dispatch through the pioneer American Gilsonite Co. pipeline. LIGHTNINS in thousands of chemical plants mix slurries of every kind, rapidly, dependably—*to the exact level of uniformity needed.* If it can be slurried, you can slurry it *uniformly* with LIGHTNINS.

If you'd like quick, competent help on slurry suspension for a specific project, call in your LIGHTNIN Mixer representative now. He's listed in Pipeline Composite Catalog. Or write us in confidence.

Good mixing helps move Gilsonite over a mountain

Solids pipeline built by American Gilsonite Co. makes the refining of gasoline from Gilsonite economically possible. It saves more than $4 per ton—a million dollars a year—over other methods of transporting Gilsonite ore over a mountain from mine to refinery.

American Gilsonite's 6-inch pipeline carries slurries averaging 38% solids and 62% water at 350 gallons per minute. It delivers more than 700 tons of solids per day at the downstream end, 80 miles from the eastern Utah mine.

Cut from the solid vein with high-pressure jets of water, the shattered ore is flumed more than a mile underground to the bottom of the 800-foot-deep central shaft.

Then the ore is screened to 8-mesh maximum, pumped to the surface with fluming water, and mixed to uniformity in 200,000-gallon holding tanks equipped with LIGHTNIN Side Entering Mixers.

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MIXING EQUIPMENT Co., Inc., 196-d Mt. Read Blvd., Rochester 3, N. Y.

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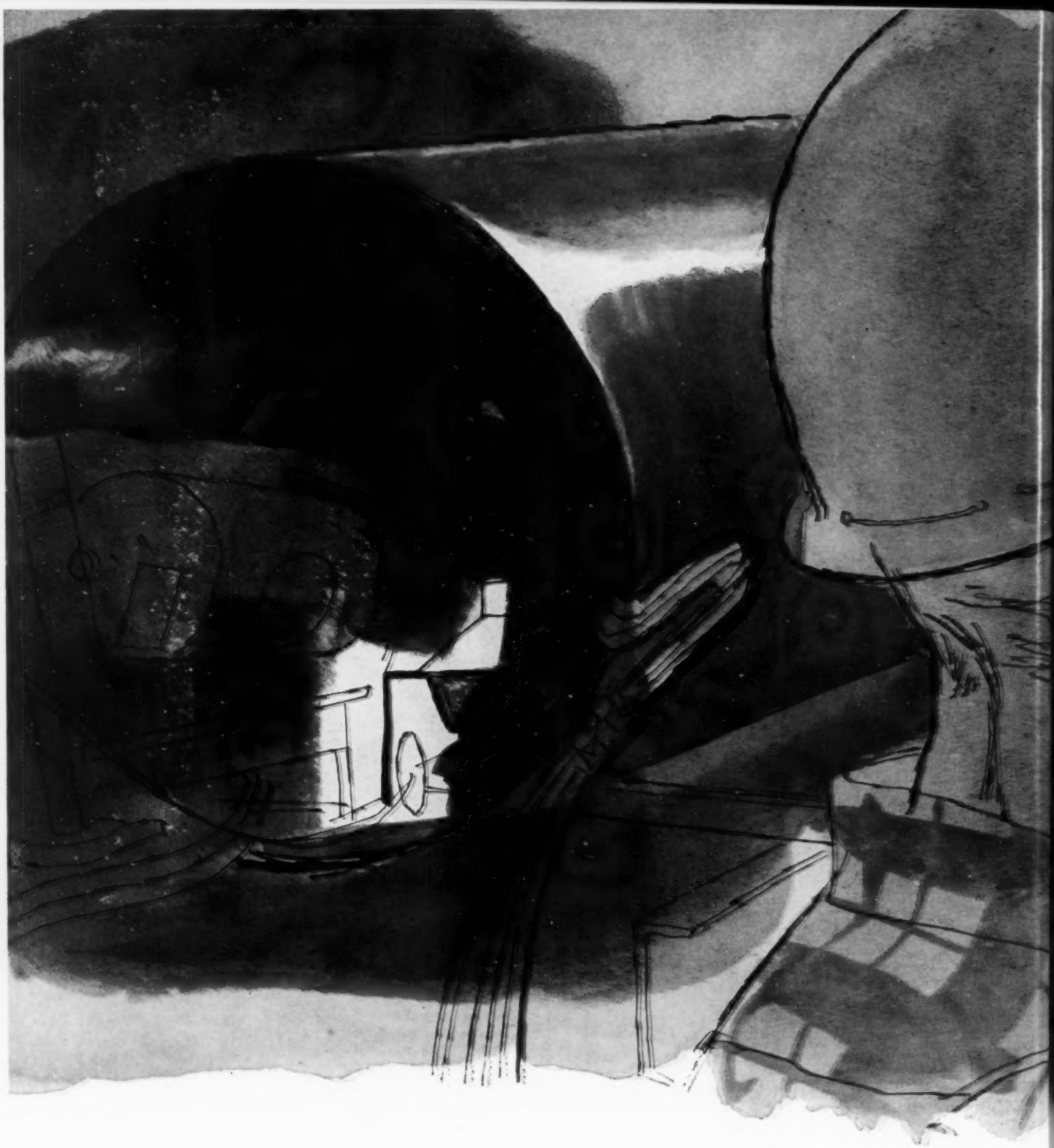

Spying on a weld

A TV camera is the spy! Located inside that hulking section of USS National Electric Weld Line Pipe, it's a visual guide to accurate welding.

The operator welds by remote control. He uses push button to operate a welding head inside the pipe. Just in front the welding head is a short-focus TV camera.

When the image flashes on the TV screen, the operat sees reference lines and uses them as a guide. This enable him to keep the electrodes for the inside weld centered the seam of the formed plate. *In short:* the TV camera mak precise guiding of the welding possible.

The constant development and improvement of production techniques are just two of the reasons why National Tube is not only the largest but also the most experienced manufacturer of tubular products in the world. For more information on USS National Line Pipe, write to National Tube Division, United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania. Ask for bulletin #23.

USS and National are registered trademarks

National Tube
Division of
United States Steel

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors
United States Steel Export Company, New York

"They engineered this oil line to a cat's whisker"—then wrapped it with Polyken tape

One of the world's largest pipeline operators chooses the world's toughest tape coating for new Patagonian oil line

A leading international pipeline company recently wrapped over 100 miles of crude oil gathering and transmission line with Polyken No. 960 Extra-Strength Pipeline Roll.

The new line, which crosses part of the Patagonian plateau of southern Argentina, is an example of perfection in pipeline design. "They engineered it to a cat's whisker," is the way a seasoned pipeliner put it.

In their construction plans, the engineers specifically called for Polyken No. 960 Tape. Seven years of testing and study had convinced these people that Polyken delivers the durable, practical protection that a precision-built line needs.

There's a lot more to be said for Polyken tape. See your Polyken representative, or call the Polyken tape coating distributor nearest you. Or simply write Polyken, 309 West Jackson Blvd., Chicago 6, Ill.

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Using tensioned-spindle equipment, pipe is cleaned and wrapped in one factory-smooth operation. Polyken tape is ready. No primer, no drying or cooling. No fumes or fire hazard.

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Polyken

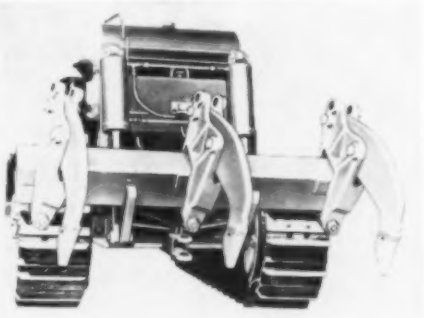
Experienced in modern PROTECTIVE COATINGS

The compressors which are applicable to field and main line use, will operate from 75 to 1,000 inlet cubic feet per minute at up to 1,500 pounds of pressure. Lower initial cost, reliability and low maintenance costs are the main features of this new unit. A Solar Saturn T-1,000 gas turbine engine, which produces 1,100 horsepower, will drive the compressor on the Trunkline system. Total weight of compressor and engine will be approximately 5,000 pounds.

The compressor is designed for high rotating speeds from 15,000 to 30,000 rpm to match the rotating speeds of the gas turbine driver; this allows direct coupling of the compressor and the turbine and eliminates the need for reduction gearing.

Another feature of the units is an interchangeable compressor wheel, which covers the compression and horsepower range. This permits field changes in the compressor to handle new flow and pressure conditions without changing complete units.

For more data, circle **No. E5** on Readers' Service Card, last page this issue.



Hydraulic Ripper

Designed to penetrate to depths of 48 inches, Greenville Steel Car Company's new hydraulic ripper for International Harvester's TD-25 is being introduced.

"The Brute" has adjustable shanks for various ripping depths. Adjustments are made quickly and easily by changing the position of movable pins in the swing brackets. Shanks swivel 15 degrees in either directon to allow points to "float" beneath the ground, seeking out cracks and weak points in rock. The ripper is stronger and heavier and designed for the heavier TD-25. Ripper weight and tractor weight are balanced, resulting in greater traction and more usable horsepower.

Several types of shanks are available. Straight shanks or 24, 42 and 48-inches digging lengths; curved shanks for use in non-blocky or non-slabby materials; and a new push block which can be attached straddling the center shank and swing beam for booster ripping are all available. Pipe line and cable laying shanks are also available.

For more data, circle **No. E6** on Readers' Service Card, last page this issue.

Control Equipment

International Controls Corporation has developed a primarily transistorized system for short or long distance transmission of control and monotoring data. Designed specifically for pipe line and production segments of the oil industry, it is primarily fabricated of transistors and similar components. This unit has been designed as a general purpose item capable of solving about 80 percent of the control problems without any modifications.

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COMPANY

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New, Heavy Duty LEAK DETECTOR . . $295.00

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For more data on advertised products, use Readers' Service Cards, last page.

"Best valve insurance you can buy"

W-K-M® ASA Gate Valves

More than 300 rigid inspections certify the precision quality and long life that's built into every W-K-M pipeline valve. That's one reason W-K-M valves are recognized the world over for their superior construction and outstanding performance.

No other valves give you the same long-lasting service and economy. No other valves require so little maintenance.

Next time — and every time — specify W-K-M! Available at leading supply stores everywhere (from 2″ through 12″). Sizes through 34″ available on special order.

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W-K-M

DIVISION OF acf INDUSTRIES
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W-K-M Leverlock® Gate Valves feature through-conduit gate construction, parallel expanding gates, exclusive gate centralizers, controlled force seating, pressure seal bonnets, super-finished stems, seating surfaces sealed from the lading flow — and can be overhauled on-the-line.

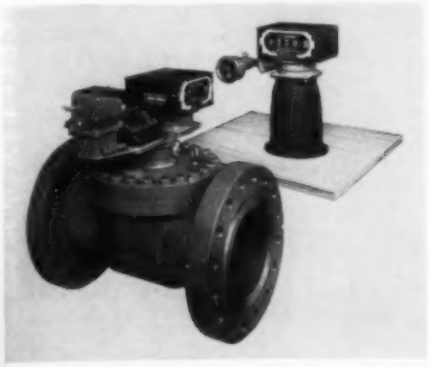
Pressure Ratings: ASA 300 through ASA 1500 pounds.

Product of W-K-M's *Creative Engineering*

5905-R

The basic unit can measure and transmit eight variables and transmit 16 on-off functions. It can receive on-off commands, set points, and similar data from a central controlling facility, and actuate pumps and valves and cause local controllers to change their control set points. The equipment is compact, light, and draws about 15 watts of power in normal operation.

For more data, circle **No. E7** on Readers' Service Card, last page this issue.



Turbine Type Meter

Granberg Corporation announces a new turbine type meter, the Granco Duo Rotor, equipped to operate at pressures up to 300 psi. The meter operating counter records thruput in hundredth-barrels; accumulative data is available for split runs or batch stream movements.

To test prove the meter there is a calibration counter that operates off the same drive as the operating counter. The calibrating counter operates only when the solenoid actuater is switched on. This counter does not accumulate and must be set back to zero each time a prover run is made.

For more data, circle **No. E8** on Readers' Service Card, last page this issue.

Digital Annunciator

A new digital sequential annunciator which clearly and instantly identifies the sequence in which a group of alarms occur has been developed by Panalarm division of Panellit, Inc. Model 51-DS is especially valuable in monitoring complex operations where one of several factors can cause automatic shutdown. This permits pinpoint analysis and immediate corrective action.

Alarms are audible as well as sequentially visible. After silencing alarm, operator may log off-normal sequence and press button to clear board of sequential identification lights.

For more data, circle **No. E9** on Readers' Service Card, last page this issue.

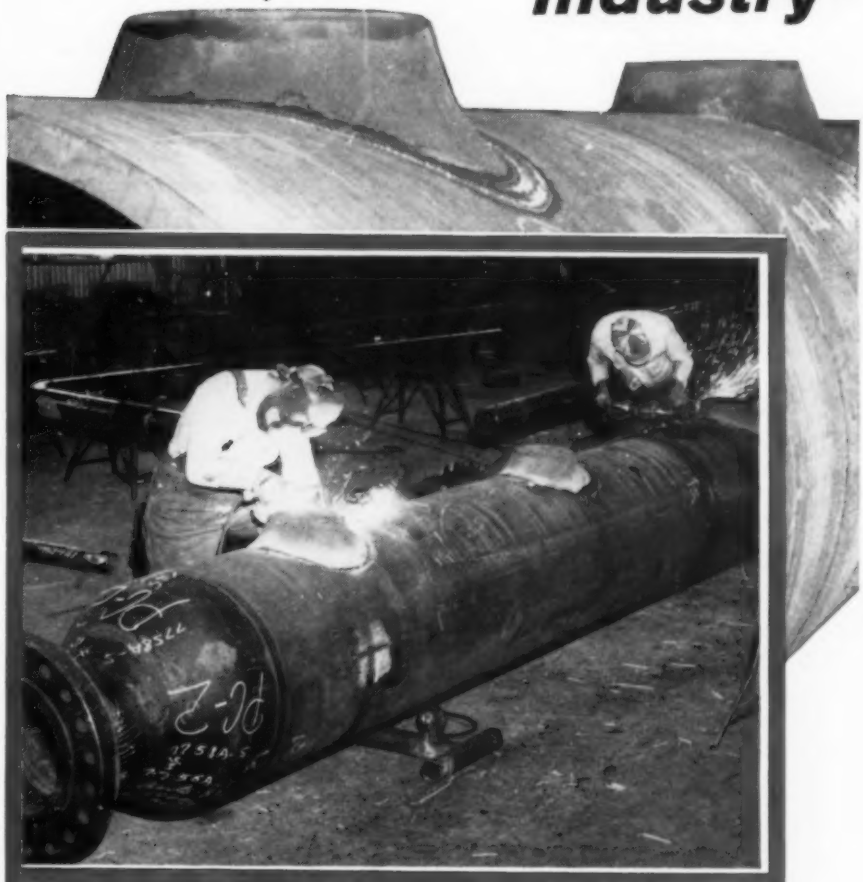
Single Shaft Turbines

Clark Bros. Co. announces an open cycle, single shaft gas turbine with an NEMA rating of 9000 bhp. The compact heavy duty prime mover has been designed to achieve savings in initial cost, transportation, floor space, foundation and installation expense.

Designated Model 305-S, it burns either liquid or gaseous fuels and is capable of continuous operation under full load conditions at normal rated speed of 5000 rpm. The single shaft design provides high rotating inertia and insures minimum speed variations under transient load con-

BONNEY SWEEPOLETS Pat. Pend. ®

---are SWEEPING the pipeline industry



The Bonney Sweepolet is an integrally reinforced insert butt welding pipe fitting specially designed for stress free branch connections on high pressure pipelines.

WRITE FOR CATALOG S-1A

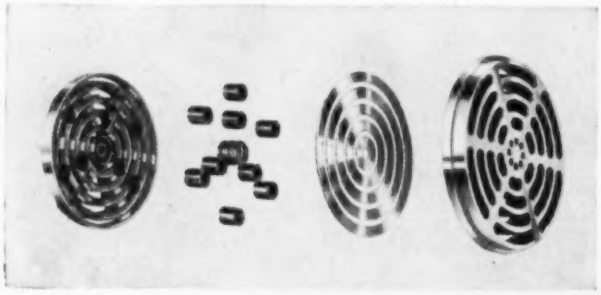
BONNEY FORGE and Tool Works

ALLENTOWN, PENNSYLVANIA

BONNEY

VOSS VALVES will mean LESS MAINTENANCE FEWER SHUTDOWNS for your COMPRESSORS

Voss Valves are made to specification, machined from solid stock (not cast)—using best alloy steels; for corrosion condition—stainless steels, such as 410, 18-8 or non-ferrous alloys—monel, inconel, etc. Plates are machined (not stamped) and ground for precise close tolerance fit; are dimensionally stable . . . ductile . . . resist fracture, high temperatures and corrosion . . . withstand fatigue. Springs of heavy rectangular sections and large diameters add to dependability and safety.



- up to 40% more valve area
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For detailed proposal send name, bore, stroke and speed of machine.

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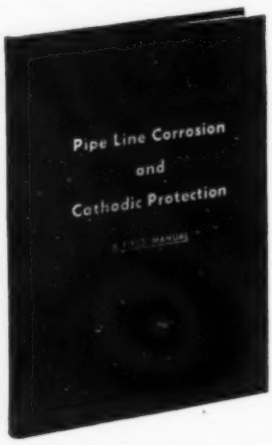

The most practical on-the-job manual for men concerned with pipe line corrosion.

Pipe Line Corrosion and Cathodic Protection

By MARSHALL E. PARKER

This book is designed as a practical field manual. It provides workable methods that can save you valuable time and effort in obtaining interpretive field data.

Contents (Condensed). Soil Resistivity Surveys, Pipe-to-Soil Potentials, Line Currents, Current Requirement Surveys, Rectifier System for Coated Lines, Ground Bed Design and Installation, Magnesium Anodes on Coated Lines, Hot Spot Detection, Stray Current Electrolysis, Interference in Cathodic Protection, Operation and Maintenance, Coating Inspection and Testing.

Appendices cover: Fundamentals of Underground Corrosion, Basic Principles of Cathodic Protection. Plus . . . tables and properties of metals, attenuation equations and index.

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ditions. At rated speed the axial compressor delivers a mass flow of 135 pounds/second. Turbine inlet temperature is held under 1400°F to isure long life and a substantial margin of operating safety. The unit is air cooled, pressurized air is bled off axial compressor to cool high temperature components. An optional air cooled lube oil cooler can be furnished to permit operation that is completely free of water requirements.

The three-stage turbine, which supplies power to drive compressor, incorporates a high efficiency volute and a rotor of built-up forged steel disc design. Alternate starting devices such as electric motors, steam turbines, diesel engines, etc. can be provided. The turbine is furnished with its own integral force feed lubrication system. The unit is mounted on a fabricated steel baseplate of box type construction for strength and rigidity.

(This item supplements Clark Bros. Co. data on pages 89-92 of the Pipe Line Catalog, Second Revision.)

For more data, circle **No. E10** on Readers' Service Card, last page this issue.

Piston Cylinder Operator

A new piston cylinder operator-valve combination providing fast operation and reduction in size, has been introduced by Grove Valve and Regulator Company.

Designed for use primarily in gas pipe lines, the unit's reduced size comes from designing the valve stem to act also as a piston rod, bringing the cylinder close to the valve bonnet. In some sizes, the valve bonnet becomes the lower cylinder head of the operator.

The valve is identical with Grove's G-4 gate valve featuring a parallel faced gate that slides between floating seats. The seal is accomplished by polished metal seal rings with nitrile rubber "O" rings held against the gate; no lubrication is necessary.

A newly designed four-way valve which controls the cylinder is available with the operator. With line pressure, gas is applied to either end moving the piston to the open or closed position. A variable orifice on the exhaust of the four-way valve controls the operating speed.

Designed for general pipe line service, the valve assembly also provides marked advantages where speed of operation or remote control is necessary, such as offshore applications or river crossings.

(This item supplements Grove Valve & Regulator Co. data on pages 213-224 of the Pipe Line Catalog, Second Revision).

For more data, circle **No. E11** on Readers' Service Card, last page this issue.

Tone Squelcher

General Electric has developed a transistorized tone squelch device that helps two-way radio users avoid hearing messages not of their own system. The new addition to General Electric's transistorized progress line has no relay nor electromechanical devices. It may be used with wide and narrow band TPL mobile units.

(This item supplements General Electric Co. data on pages 199-202 of the Pipe Line Catalog, Second Revision.)

For more data, circle **No. E12** on Readers' Service Card, last page this issue.

NEW N P

WmSON "PIG-SIG II"

CAN BE INSTALLED OR REMOVED UNDER PRESSURE!

CUTAWAY VIEW OF PIPELINE

Gives visual or electrical indication of pig passage. Pig-Sig II with electrical indicator signals pump station operator or starts operation of automatic equipment. For other applications and complete details write for bulletin A-199.

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Designed To Help Industry Meet A Real Problem

THE DRINKING PROBLEM ... and its control

By C. A. D'Alonzo, M.D., F.A.C.P.

Price $2.95

This book deals not only with alcoholism generally, but also with its effects, care and treatment when encountered on the job. It provides answers to many important questions such as: What is alcoholism? What is industry's role in the problem of alcoholism? What are the community problems related to alcoholism? What are the major signs that indicate existence of a drinking problem? What is the treatment? Is there a cure?

The author is assistant medical director of E. I. Du Pont de Nemours and Co., Inc. Du Pont is well known for its efforts to rehabilitate the alcoholic worker.

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P. O. Box 2608, Houston 1, Texas

So SIMPLE We Can Adapt It to ANY LIQUID LEVEL CONTROL JOB

A sleeve, raised and lowered within a non-magnetic tube, attracts or releases an Alnico magnet attached to a mercury switch. Basically, this is Magnetrol.

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● No matter how specialized the liquid level control application, adapting Magnetrol to meet it presents no problem. Whether it's for high pressures, high temperatures, corrosive liquids or any other condition, a few "standard" modifications and the job is done! Operation is so simple no changes in basic design are needed. That's why Magnetrol "fits" practically any application — why "specials" are so often standard with us.

Because of the utter simplicity and dependability of its magnetic principle, Magnetrol has *infinite operating life.* There are no wearing parts to get out of order.

Magnetrols are available for controlling level changes from .0025-in. to 150-ft., with single or multi-stage switching. Our experienced engineering staff is at your service.

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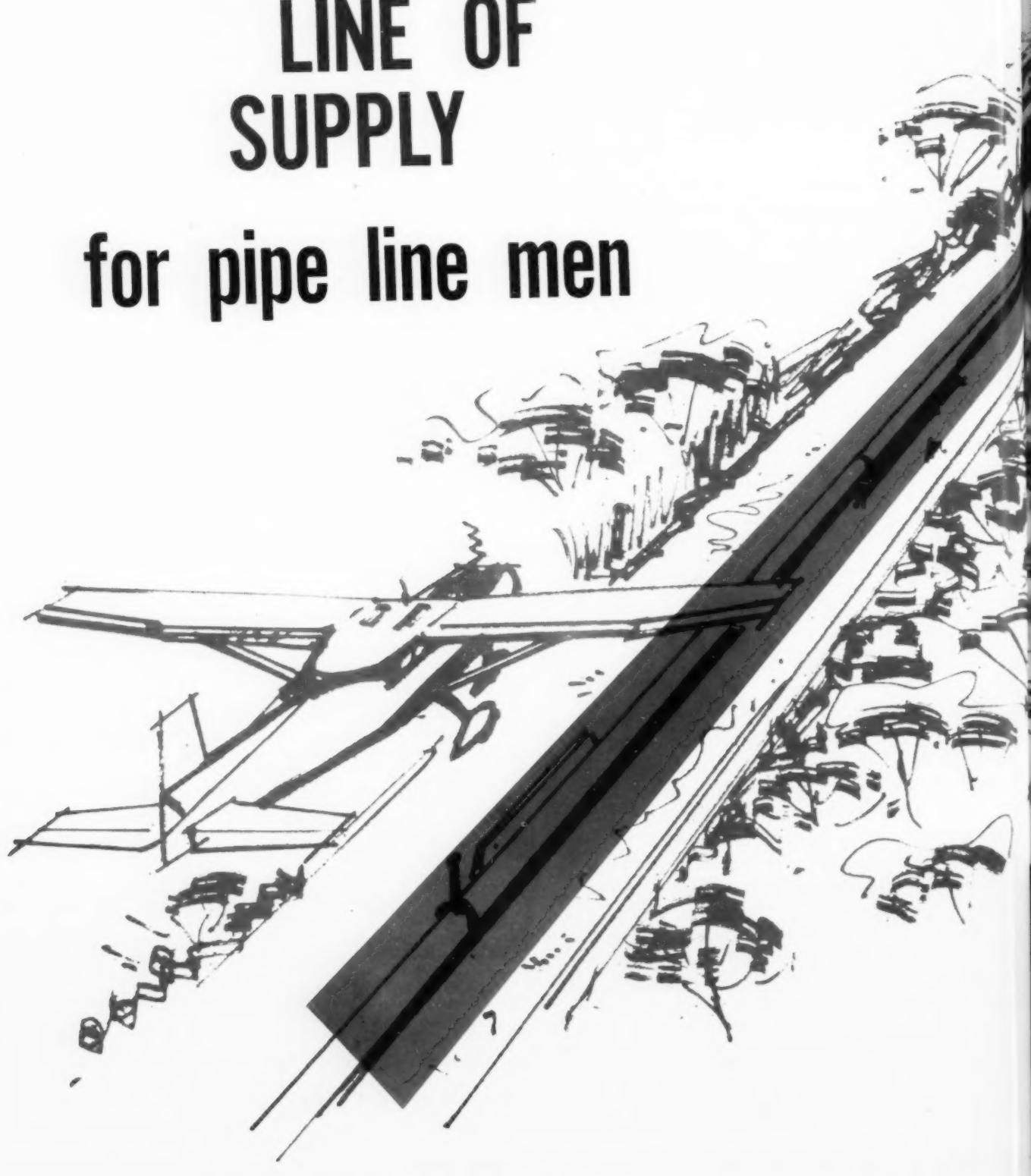
THE STRAIGHTEST LINE OF SUPPLY

for pipe line men



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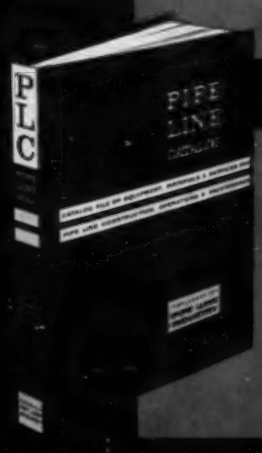

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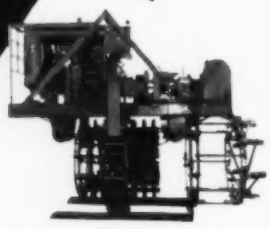
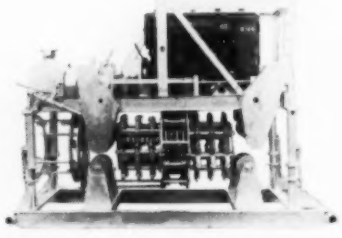


MYOCO MODEL "DR"

Especially designed MYOCO Counter Rotating Heads on this cleaning and priming machine give double cleaning action to pipe.

Seam welds are cleaned thoroughly on both sides.

This fast, dependable unit is powered by an International U-9 self-starting engine using the Ramsey transmission. Engine exhaust is utilized to heat primer tank. Sizes: 3" through 36".



MYOCO CLEANING AND PRIMING MACHINE

Set on a stationary base for yard cleaning this 6-12 Model will clean and prime pipe 3" through 14" diameter plain end.

These machines, like all the equipment at Myoco, can be rented to save you capital, investment and storage costs. Trained, courteous personnel are available 24 hours a day with fast transportation to serve you. Efficient equipment operation is assured by periodical checks. All parts and supplies are shipped the same day, when possible.

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New Equipment Literature

For more data on New Equipment or copies of Catalogs and Literature reviewed in this issue, use the Reader Service postcards just inside the back cover and facing the Advertisers' Index. Simply circle code numbers of items desired—sign and mail card.

Welding Electrodes

A comprehensive welding electrode catalog has been published by Hobart Brothers Co. It covers the manufacturer's complete line of welding electrodes, gas welding rods, non-consumable electrodes, submerged arc welding flux and automatic welding wire.

The catalog includes application diagram and gives complete details of each electrode such as description, color code, outstanding features mechanical properties, typical chemical analysis of weld metal, size and typical applications.

To get a copy, circle **No. E13** on Readers' Service Card, last page this issue.

Ripping Uses

Caterpillar Tractor Company announces availability of an 8-page brochure titled "Caterpillar Rippers."

The highly illustrated bulletin includes construction details and operation of rear-mounted, hydraulically operated rippers for the Caterpillar D9, D8, D6 and D4 tractors and No. 977 and No. 955 trax-cavators.

To get a copy, circle **No. E14** on Readers' Service Card, last page this issue.

Pipe Valve Locator

A pipe valve and cable locator is the subject of a 2-page bulletin published by Gardiner Electronics Company. The improved transistorized unit features single turn transmitting and receiving coil cast right into the fiberglass case.

Transmitter and cable are powered by four flashlight batteries each and give an average life of 1400 hours. A total of 11 transistors are used; 4 in transmitter and 7 in receiver. Transmitter has a switch to allow for good and poor conductive ground and the receiver has a 3 position sensitivity switch plus a variable gain control.

To get a copy, circle **No. E15** on Readers' Service Card, last page this issue.

Diesel Crawler Tractor

A highly detailed and illustrated 2-page catalog has been produced by International Harvester on its TD-25 diesel crawler tractor, largest and most powerful tractor manufactured by the company.

The 3-color catalog includes cutaway drawings and depicts highlights of the torque converter and gear drive versions of the 230-engine-horsepower unit. The TD-25 has a four-cycle, International TD-817 direct start, turbocharged engine, with a 5⅜ by 6-inch bore and stroke and a 1500 rpm rated governed speed. The torque converter model has drawbar pull of 70,000 pounds.

To get a copy, circle **No. E16** on Readers' Service Card, last page this issue.

Control Valves

A new catalog offered by Hammel-Dahl Div. of General Controls Co. is titled "Automatic Split-Body Control Valves and Accessories."

The 20-page publication includes data on the new "S" and "Y" style split valves, each having its own angle variation. Conventional split-body valves having accuators perpendicular to the pipe line are offered with the Y type having accuators at a 45 degree angle to the pipe.

Detailed specifications, data and dimensions of various valve bodies are covered.

To get a copy, circle **No. E17** on Readers' Service Card, last page this issue.

Power Shovel

The Thew Shovel Company has published a 24-page catalog on its Model L85A power shovel. It is available also as a crane, clam, dragline and hoe.

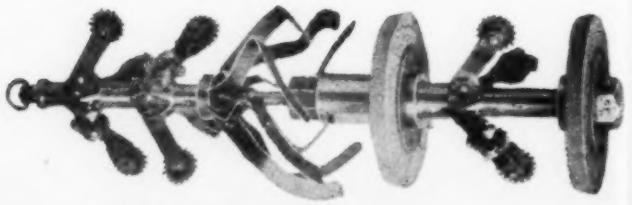
Featured are a new 10-year warranty on the "Shear-Ball" connection, 2 lever joy stick controls and square-tubular-chord crane boom. Booklet covers details of machine's construction and photographs of the unit at work.

To get a copy, circle **No. E18** on Readers' Service Card, last page this issue.

Go-Devil

NORTHRUP GO-DEVILS

Heavy Duty Model with Neoprene cup or disc drivers



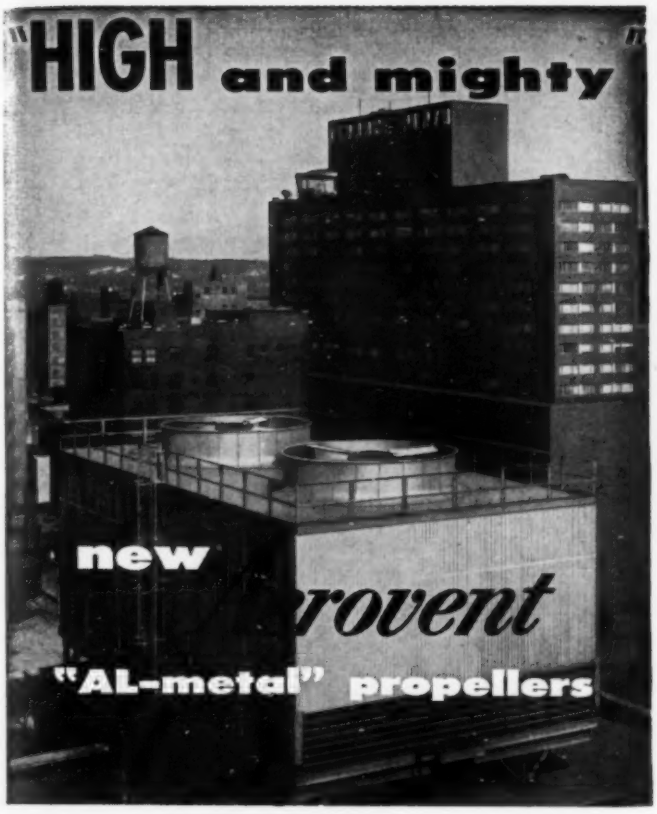
G. A. COTTEN CO.

Manufacturers of TRANSIT PIPE LINE SCRAPERS

NORTHRUP GO-DEVILS &

P. O. Box 5332

Tulsa, Okla.



move mountains - of AIR!
in towers and exchangers

- Sizes 14' to 18'
- 4 or 6 blades

Developed originally for the petroleum industry, Aerovent Large-Diameter "Al-metal" Propellers, constructed of tough, durable aluminum alloy, move great quantities of air at high velocities, in heat exchangers and cooling towers. Pictured above are two 4-blade, 16-ft. propellers in a cooling tower installation. These mighty propellers, with adjustable-pitch "Macheta" Airfoil blades, are job-engineered to individual specifications.

Write for free Bulletin 510

DESIGNED FOR DEPENDABLE OPERATION!

Endurance tests, conducted at *3 times* normal loading prove the ability of these new large-diameter propellers to withstand severe punishment. Heavy-duty cast steel hubs offer maximum resistance to stresses. Angle settings for each operating requirement, and appropriate alternate settings, assure accurate pitch for any predetermined performance which may be required. 54" to 144" now available in Adjustable Pitch Models.

REFINERIES, pumping stations, industrial plants and commercial buildings use Aerovent "Al-metal" Propellers in major air-moving applications.

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LARGE PROPELLER DIVISION
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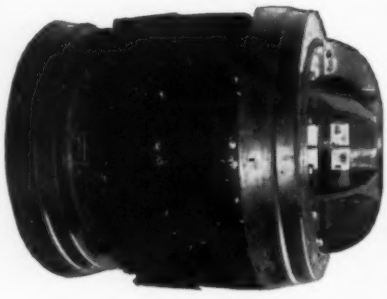

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PRODUCT LINES
NATURAL GAS LINES

FOR DETAILS WRITE

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Fort Madison, Iowa

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Nothing less satisfies this Company and its customers. Let Acme-Newport serve you, too, with electric weld line pipe in 4″ and 6″ sizes, standard or thin wall.

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NEWPORT, KENTUCKY
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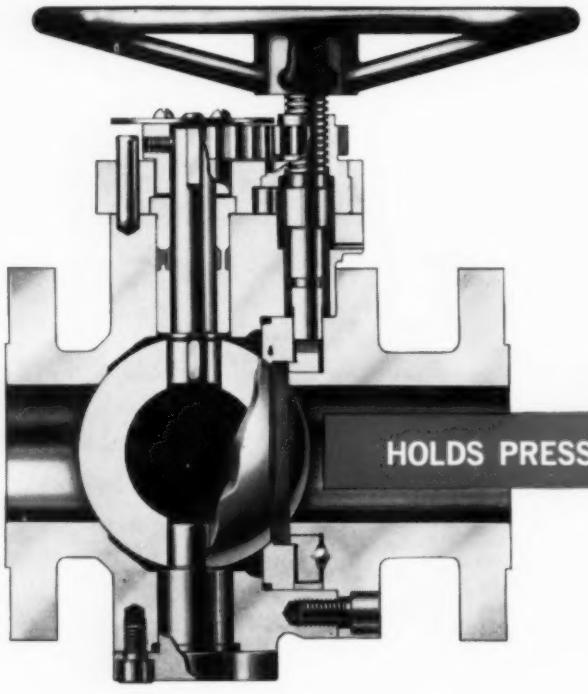
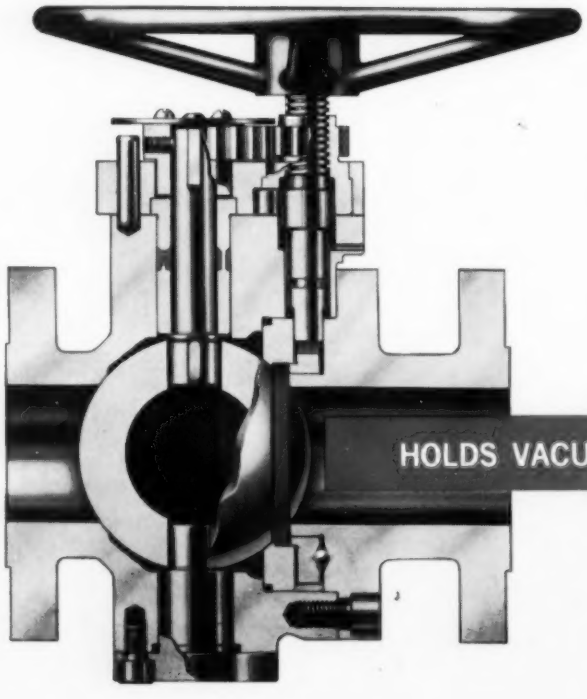
4½	.125″	5.84
	.142″	6.61
	.156″	7.25
	.188″	8.64
	.219″	10.00
	.237″	10.79
6⅝	.156″	10.78
	.188″	12.89
	.219″	14.97
	.250″	17.02
	.280″	18.97

Exclusive Controlled Compressible Port Seal provides fast, positive shutoff in any service...





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●

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